

# SUPPLEMENT.

# The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

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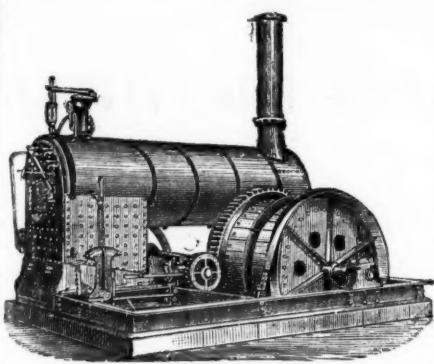
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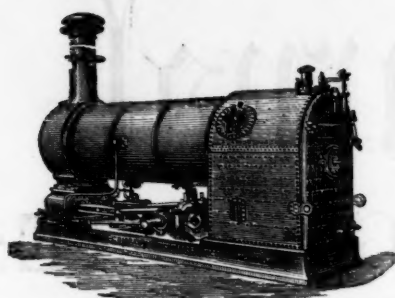


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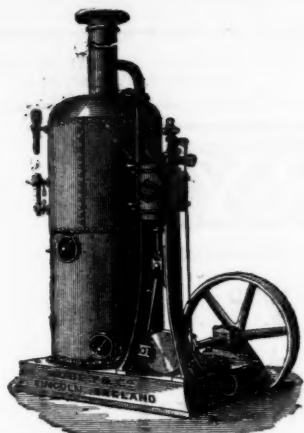
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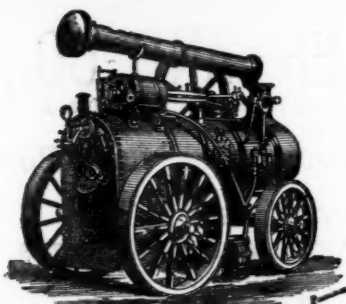
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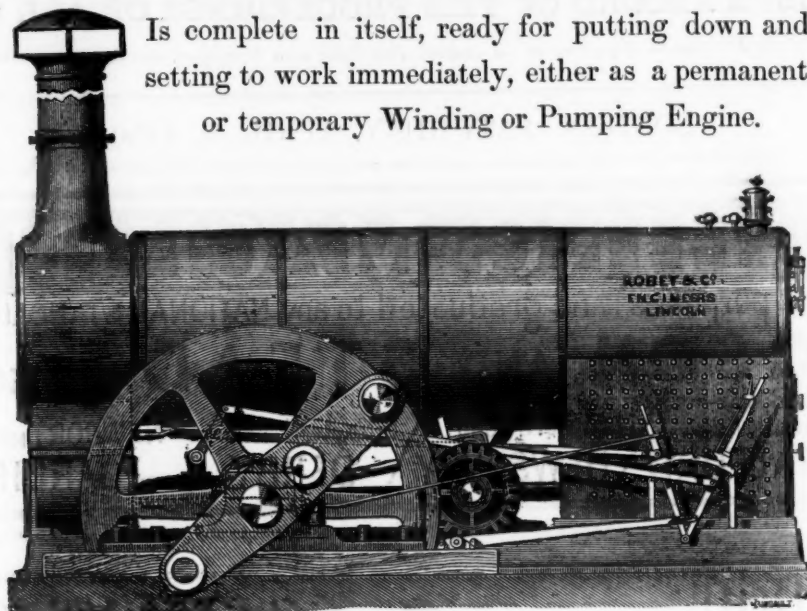
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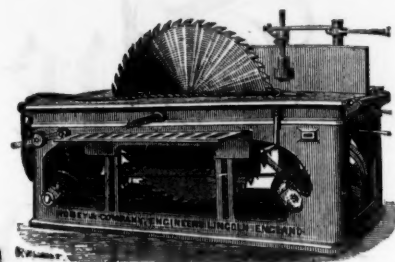
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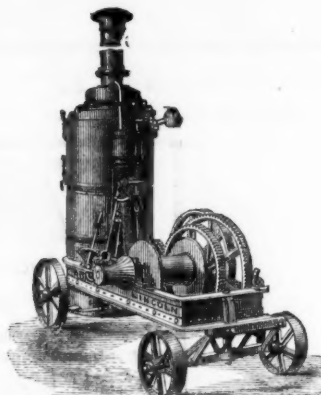
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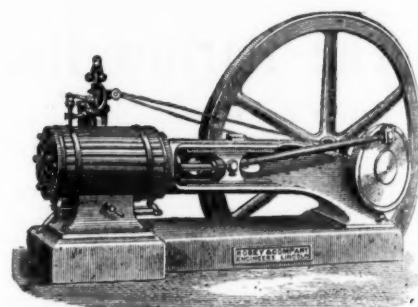
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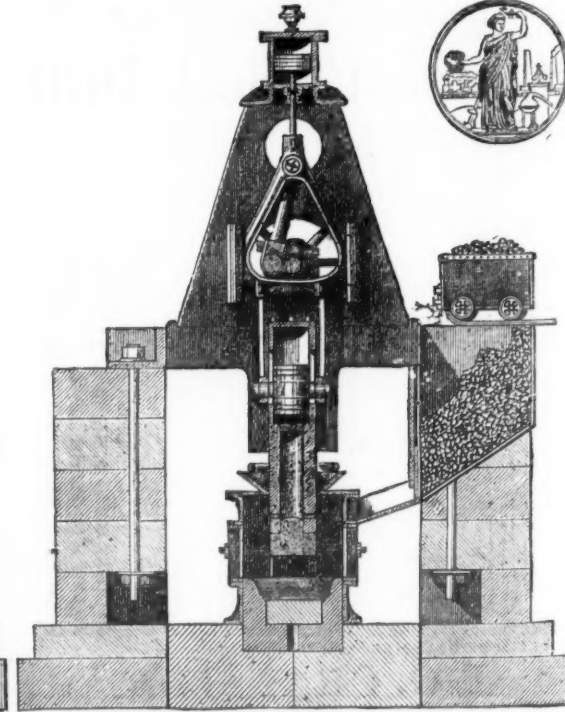
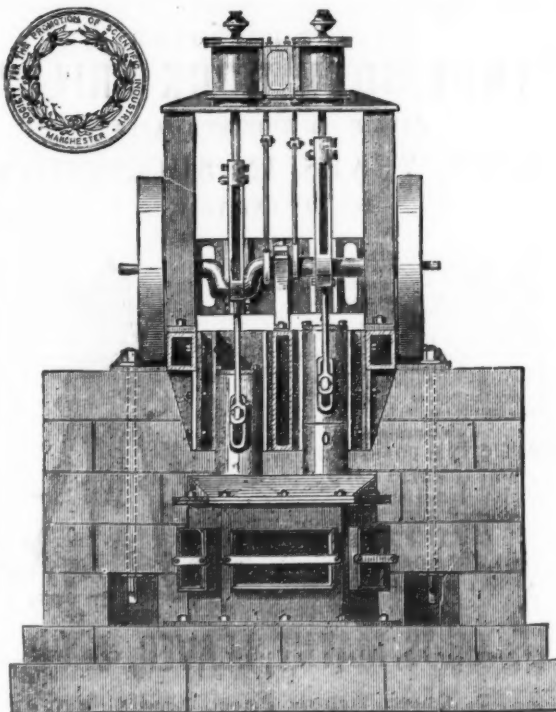
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## Original Correspondence.

## PUMPING ENGINES

SIR,—In reply to "D. B.'s" letter I have pleasure in giving you the following results of the working of my engines. I also send you several certificates, from which you will see that the results I give are not exceptional. Expansion is the leading principle of economy, and the engine which works with the greatest amount of expansion is, *ceteris paribus*, the most economical. The compound differential engine works more expansively than the Cornish, with less strain and greater safety.

The following comparison of the two systems—Cornish and compound differential—are taken from actual tests in practice:—

	Initial pressure.	Ratio of expansion.	Average pressure.	Maximum piston velocity per minute.	Relative Effective strains on piston per engine.	Speed.
Cornish ... 31 lbs.	3	16 lbs.	600 ft.	1.8	100	
Ditto ... 45	4½	19	500	2.26	80	
Differential 43	6½	13	228	1.4	168	
Ditto ... 80	8	24	220	1.37	150	

The best proof of the efficiency of the differential engine is the very wide adoption it has received, especially for heavy pumping, vide page 11 of the enclosed pamphlet.

HENRY DAVEY, M.I.C.E.

Leeds, March.

The following is the result of a trial of a compound differential engine at the East Hetton Colliery:—

Mean stroke of engine	7 ft. 2½ in.
Mean number of double strokes per minute	8
Mean piston speed in feet per minute	115 ft.
Mean pressure of steam in engine-room	62 lbs.
Mean vacuum in condenser	11½ "
Mean effective pressures in cylinders—	
Front of high-pressure cylinder	44.79 lbs.
Back of ditto	48.52 "
Front of low-pressure cylinder	9.03 "
Back of ditto	10.37 "
Indicated horse-power developed—	
In high-pressure cylinder	146.42
In low-pressure ditto	108.05 = 254.47-h.p.
Condensing water—	
Quantity of water discharged per minute over tumbling bay	1877 lbs.
Mean temperature of ditto	103.5°
Mean temperature of injection water	55°
Rise of temperature of the water in the condenser.	48.5°
Pounds-degrees of heat discharged from the condenser per minute	91,034 units.
Ditto per horse-power	357.7 "
Consumption of steam per horse-power per hour	22 lbs.
Equivalent duty per 112 lbs. of coal, assuming each pound of coal to evaporate 9 lbs. of water	90,720,000
Equivalent duty per 112 lbs. of coal, assuming each pound of coal to evaporate 10 lbs. of water	100,800,000
Effective work performed in pumps	198.6-h.p.
Effective work in percentage of ind. horse-power	78.05 per cent.
Duty 100,000,000 on an evaporation of 10 lbs. of water per 1 lb. of coal.	

Water Engineer's Office, Town Hall, St. Helens, Oct. 20, 1879.

I have pleasure in recording my continued satisfaction with the working of our Sutton engines. I have just made up our yearly returns of costs, and I cannot do better than give you them:—

	Cost of fuel (slack) per 1000 gallons per 100 ft. of lift.
Eccleston Hill (Cornish)	1.309d.
Whiston (Cornish)	1.142d.
Sutton (differential)	1.121d.

This shows in favour of the Sutton engines, notwithstanding that we supply our boilers there with cold water from the main, the condensed water, as you are aware, being pumped to waste on account of the exceptional hardness of the water. Reducing the whole cost of each pumping station, including fuel, wages, stores, and repairs, the results are as follows:—

	Total cost per 1000 gallons per 100 ft. of lift.
Eccleston Hill (Cornish)	1.284d. exceptional repairs.
Whiston (Cornish)	300d. "
Sutton (differential)	29d. "

D. M. F. GASKIN.

\* The Sutton engines are of very small first cost compared with the Cornish.

## ON SHOT-FIRING.

SIR,—The great mischief that shot-firing has been the cause of in coal mines has led to the invention of several appliances as a substitute for the use of gunpowder. The principal of these which are remembered at present are Chubb's hydraulic coal-breaker, a similar machine by Jones and Bidder, Harrison and Elliott's wedge apparatus, and Reuss and Co.'s compressed air cartridge. Though superior results in point of safety were expected from these appliances at the time of their introduction to what gunpowder affords, yet none of them have to a great extent taken the place of gunpowder in breaking down coal; whether this arises from inherent defects in the machines, or from tardiness in adopting new inventions, the writer is not able to say. It would be well, however, if those who can speak on the merits of any one of the appliances would be good enough to give such information to the public as they are in possession of in regard to their efficiency and adaptation to the purpose for which they were designed. Such information would be the means of bringing into notice at least anything of utility that has been accomplished with these inventions in the way of substituting them for gunpowder.

So many explosions of fire-damp have been attributed to shot firing, more particularly to blown out shots, that it is highly desirable this question should have most careful consideration, and the mystery which seems to surround the subject of shot firing should be solved as far as that can be done by human endeavours. It is now generally believed that when the force of exploded gunpowder is not expended on its proper object—that is, in bringing down coal—it will in the form of a blown out shot have the effect of creating a vacuum in the face of the roadway or other working place where the blast has been made. In seams producing fire-damp the effect of this temporary relief from the atmospheric pressure of 14½ lbs. or more to the square inch will be to liberate copiously the gases which ordinarily exude in a much less degree from the pores of the coal. Blown out shots are of very frequent occurrence in the Lancashire and Midland counties; they are the result of insufficient stemming of the shot hole, or of too heavy charges of powder; these heavy charges are the more required from the omission of the practice in many other districts of cutting or nicking the coal at one side of the place, the cutting being made at the bottom of the seam only. When a charge of 1 to 2 lbs. of gunpowder is fired, and from one or more of the above causes it blows out, and spends itself in the open space of the roadway and its vicinity, then it is probable three or more results will happen; the flame from the gunpowder alone may extend as far as 10 yards from the point at which it ignited when it is not supported by other combustible matter. Experiments have, however, been made which go to prove that with the addition of coal dust the flame from the shot will travel 50 yards or more, and the force of the blast is greatly intensified by the presence of this dust; in very dry and dusty mines there is more need of precaution against this danger, the coal dust having so much more effect in intensifying and extending the distance to which the flame travels. Again, this intensity of the blast will have the greater effect in relieving the atmospheric pressure at the face of the coal and of liberating gas, so that it is almost certain to be found there after a blown out shot has gone off. It would be injudicious to fire two shots together in the same place; the first one that went off might liberate gas and raise the coal dust; the second shot a moment or two after might ignite the explosive mixture. One or more explosions have occurred in this way. This applies more particularly to heavy charges of powder, or to blown out shots.

Mr. Galloway has found from experiment that 2 per cent. of fire-

damp in the atmosphere in which a quantity of fine coal dust is floating constitutes an explosive mixture. We see here another probable cause of explosions, more particularly in dusty mines, and where the dangerous practice of overcharges of powder is allowed.

The writer believes that getting coal by blasting with gunpowder should be discontinued in favour of safer and more perfect appliances, seeing the imminent risks that are associated with the use of the former. The occurrence of a blown-out shot ignites the coal dust in dry mines, the flame under these circumstances extending to a considerable distance; it causes a vacuum at the face of the working where the shot has been fired, instantly drawing an inflow of gas into the place, thus giving the materials for causing an explosion. It is desirable, therefore, from these considerations that the use of powder in fiery mines should be discontinued. No effort should be spared by those in charge of coal mines to place them on a safe footing, and by the adoption of the most approved system of working, ventilating, and laying out the mines, to raise them to the highest possible standard of safety, if this has not already been done. It is satisfactory to know that the system of long-wall working is rapidly gaining ground. Where this system is properly carried out there is rarely any necessity for using powder; the weight or pressure on the face of the coal performs what has to be done by mechanical means in the narrow and stall work systems, and a much better result, in an increased production of large coal always follows. This is, perhaps, the best solution of the question that can be obtained, where the system of working brings into action natural forces, performing the work required most effectually and with the greatest safety, not only as regards dispensing with the use of powder but in the facility that longwall working gives for efficient ventilation.

In the ordinary system of longwall a straight face of from 200 to 500 yards or more is worked away at once, the gateways are made through the goaf at a distance of about 40 yards apart; on each side of these gateways a pillar of 10 to 12 ft. in width is built, the material is got chiefly from taking down the top stone in the gateways. Where there is a strong band of stone intermediate packs are built 6 ft. wide; two or more may be built. Or these packs are sometimes built with the fallen stone in the goaf, that is where there is no strong band to be utilised, but only small coal and refuse to be thrown back into the goaf. The formation of the intermediate packs affords a support for the gradual settling down of the roof, causing some pressure on the face of the coal without breaking off at the face. This is prevented besides by the use of two rocks of chocks along the line of face, in other cases by props only. The subsidence of the top generally ceases at 70 yards back from the face. The getting of coal by this method is generally undertaken by three classes of men—the holers, the shooters, and the fillers. The produce of large coal has been obtained as much as 68 per cent. of the whole in some cases, where by the bord and pillar system only 46 per cent. has been obtained on an average of the whole and pillar working; and supposing the cost of getting the coal to be the same in each system, the increase in produce of large coal under the longwall gives it a decided superiority over the bord and pillar system.

M. E.

## EXPLOSIVE AGENTS APPLIED TO INDUSTRIAL PURPOSES.

SIR,—In the interesting account which you gave in the Journal of Saturday last of the paper which was read at the Institute of Civil Engineers, by Prof. Abel, on Explosive Agents applied to Industrial Purposes, you mention the strong terms in which the author repeatedly refers to the "mischievous and frequently disastrous effects of mis-leading statements with regard to the safety of particular explosive agents, such as the absence of noxious gases in connection with their use," &c. Prof. Abel, in calling attention to these statements, said that they had been put forward quite as much in respect to gunpowder as to other explosives. There is no doubt that in close and confined spaces the firing of any description of explosive compound is more or less deleterious, and it is to be hoped that your correspondents who write upon these matters will in future abstain from wearying your readers with trade puffs as to the danger of one explosive and the harmlessness of another in this particular respect.

W. J. H.

## MINING IN IRELAND—No. XII.

## CONVERSATION BETWEEN A FATHER AND SON.

FATHER.—From the fact that I have given you but a rough outline of the mineral resources of Ireland with regard to other minerals, iron ore can be no exception to the order of our procedure from the outset, as attempting anything in detail would involve much time and the writing of volumes. As it is we have trespassed much on the space of the *Mining Journal*, and I propose that we tender the Editor our best thanks for inserting your notes.

SON.—I have great pleasure in seconding a vote of thanks to the Editor of the *Mining Journal*, father.

FATHER.—There are two kinds of iron ore very abundant in Ireland—brown hematite iron, chemically known as the hydrated peroxide ( $2Fe_2O_3 \cdot 3H_2O$ ), containing when pure 60 per cent. of metallic iron; and clay, ironstone, carbonate of iron ( $FeCO_3$ ), containing when pure 48 per cent. metallic iron, and will average in the bulk 38 per cent. metallic iron. The brown iron ore is found in abundance, associated with beds of coal, fire-clay, and the carbonate of iron in the coal district of Tyrone; it also occurs in quantity at Glandore, in the county Cork, in connection with manganese ores, and an impure variety known as bog iron ore is widely distributed throughout the island; beds of it above 1 ft. thick are found in almost every deep morass, and hence its name bog iron ore; this latter was the chief source of supply to the manufacturers of iron in Ireland two centuries ago, when iron was an article of export from that portion of the kingdom to London and our other English markets. Similarly circumstanced as we find it in our own coal districts, clay ironstone occurs in great abundance in the coal districts of Leinster and of Connaught, in Ulster, in the county of Fermanagh, in the county of Cavan, in Tyrone, near Lough Neagh, in Antrim, in King's county, in Queen's county, in Clare, in Roscommon, by the side of Lough Allen, and in the county Leitrim by the same lake.

SON.—I have noticed that large quantities of Irish ore are brought over to Cumberland and Lancashire for the purpose of mining with the rich red hematite iron at the smelting furnaces.

FATHER.—The Ulster iron ore finds a considerable outlet to our West Coast furnaces; it occurs in great abundance, and is very easily worked, and indeed the Leinster and Connaught ores are also found under very favourable conditions.

SON.—I am very much surprised, father, that such a good mineral producing country as Ireland should be to a great degree neglected by our enterprising people who are so very readily hooked into foreign schemes of whatever class.

FATHER.—There are some foreign speculations which turn out well and become a source of considerable income, such as mining in Spain, where there is a great abundance of mineral, but like Ireland, Spain is shunned by many as rather too near home for yielding profitable returns. Witness what a difficulty is experienced in floating a mine of any kind in the British Islands at the present time, while there is a complete *furore* and a rush for shares in any real or imaginary concern located in Siberia, China, or even the unexplored and burning regions of the tropics; not but I know there are respectable and honourable men engaged in the promotion of foreign mining, and when such is the case the venture is to a great degree safe, but how many bubble schemes follow in the wake of the real *bona fide* concerns. You may generally estimate foreign mining by the respectability or otherwise of the promoters. Home mines you can see and judge for yourself, or obtain reliable advice for a mere trifle at any time. Would you believe it, John. I know some mines in Ireland, and even in the richest mining districts of England, where large reserves of ore are actually laid open, and that may be very profitably worked at about a week's notice. Nothing to be done but attack the ore and dress it for market, and notwithstanding this and most favourable reports from the best mining authorities in the kingdom, the mines stand idle, even though the metal market is so favourable of late.

SON.—It seems a fatality, father, that we should scramble off to unknown regions in the too often vain hope of making a speedy fortune, while we may with a little prudence enrich ourselves at home.

FATHER.—The sinews of undeveloped industry present themselves as various forms in Ireland, and the facilities for export and import

which the country naturally possesses gives additional security to the success of any enterprise which may be there established under such favourable conditions as mining presents. You must not infer from this that wherever spots of ore present themselves we may with certainty make a fortune, for such is not the case there, no more than in other mining countries; suffice it to say there are many real good mineral properties there, pronounced as such by first-class authorities who have witnessed mining in all its phases both at home and abroad. As I informed you before on two or three occasions, good selections are essential to successful mining, not alone in Ireland but in every other country as well. The array of so-called indications which are seen in some localities have deceived many, for inexperience has taken the counterfeit coin for genuine cash, hence vexatious disappointment.

SON.—I agree with you, father, in all business transactions a good knowledge of the situation is essential to success, notably so in mining. By the way, I have good news from Ireland this morning—a friend of mine has discovered a new copper mine of great promise near Burrellislaugh in Tipperary.

FATHER.—Good new mines, as a rule, are to be preferred to old and deep ones. We will now pass on to a few particulars regarding slate quarries. The most extensive slate quarries in Ireland are those situated near Killaloe. The district of the slate rock is about 20 square miles in extent. The slates are of the very finest quality, and can be had of almost any size; some have been extracted as big as 10 ft. square. The slate company employ usually about 700 hands, and produce 10,000 tons dressed slate per annum. From this vast extent of slate country any conceivable quantity may be obtained, but unfortunately the demand is limited. The Silurian formation in the Island of Valentia affords slate of a coarse texture, but which possess great strength, is a good building material, and produces beautiful flags. Slabs of Valentia slate are easily obtainable, 30 ft. long, 4 and 5 ft. wide, and from 6 to 12 in. thick. Slate and slab quarries may be opened at the Browhead, near Crookhaven, in the county of Cork, where there is great facility afforded for shipment away by their proximity to the sea. From Leap to Rosscarbery, a distance of six miles, also in Cork, a belt of slate rock extending the whole distance has given rise to the opening up of several very profitable slate quarries, and there is a large export trade from Glandore Harbour close to the village of Leap; a good local business is also carried on. The principal quarries are at Benduff, 1½ mile from Rosscarbery. As to quality, it is considered the Benduff slate is equal to the best obtained in Wales, but the same amount of energy is not expended on these quarries as the Welsh. At the old Head of Kinsale slate quarries have also been worked. Slate quarries have been opened at West Port, in Mayo, and at Ross, in Waterford. These slates are rather softer than those of Killaloe and Benduff, but are obtained of considerable size.

SON.—Owing to the unlimited supply of slate obtainable in Wales the demand for Irish slate must not be very great.

FATHER.—Had the country been in anything like a flourishing state her home requirements would be considerable, besides which labour is very much cheaper in Ireland, and they can supply the manufactured article cheaper than the Welsh, which will always ensure a fair export demand to the Irish slate companies.

SON.—It struck me at our last conversation, when speaking of geology, that the granites, basalt, limestone, marble, sandstone, &c., must afford some good building material.

FATHER.—Though this is rather a digression from the subject of our discourse, it is, nevertheless, of such importance that it claims our attention for awhile, especially as the cost of building material is often a considerable item when starting a new mine in a remote district, or where the material must be brought from a distance. At our last conversation we were dealing with the geological position of the country in a mineralogical point of view. Now, we will consider the geology of Ireland as to its capabilities in producing material for building purposes, &c., always bearing in mind that anything like detail is out of the question, and only the roughest outline possible in a conversation like this. We have already shown that slate and slabs in quantity and of good quality are obtainable in Ireland. And now we will speak of the varieties of rock or stone of which the island is made up. The limestone formation, including lower, middle, and upper or mountain limestone on which the coal formation rests, occupy by far the largest area of the geological series the whole width of Ireland from east to west in a direct line from Dublin to Galway, a distance of 120 miles, nothing but lime rocks is seen, and north and south the lime formation extends above 100 miles. The lower lime prevails in the area just named, and furnishes some of the valuable marbles of Galway, Kilkenny, Carlow, Mayo, and a few other places. The middle lime is seen near Dublin, and extends northward towards Westmeath and Longford, and the mountain limestone is mostly observed fringing the coal fields, a description of which I have already given you, so that it is needless to repeat that the coal formation consists of a series of sandstone and slaty rocks which rest upon the upper limestone, and give an appearance of considerable elevation to the districts, which are seven in number, one being in Leinster, two in Munster, three in Ulster, and one in Connaught. The granite rises from beneath the more recent formations at various places situated mostly along the coast. There are four principal tracts of granite—that of Wicklow, Galway, Newry, and Donegal. The first commences near Dublin, and stretches in a south-westerly direction to Wexford, a distance of about 70 miles; its greatest width is not above 8 miles. The granite district of Galway commences at the town, and is the coast rock of the Bay on the north side; it covers an area of 36 miles by 12. In Armagh and Down the hills of Carlingford and Moura Mountains are composed of granite; the extent of this granite range is 12 miles by 8. The fourth locality of granite is on the north-west coast of Donegal, and is 35 miles long and 18 miles wide. There are numerous other small granite protrusions such as are seen in Tyrone, Sligo, Fermanagh, Mayo, Cavan, Kilkenny, and Wexford. Mica slate occurs in Donegal, Galway, Derry, Tyrone, and Mayo, occupying a large area of the two former. The localities of clay-slate having been named in our last conversation, it would be superfluous to define them here.

SON.—Is there no Old Red Sandstone formation in Ireland, father?

FATHER.—The Galtees and Rooley Mountains are composed of Old Red Sandstone; we see it also in Longford, Roscommon, Clare, Queen's County, Mayo, and Tyrone. New Red Sandstone forms the valley of the Logan, near Belfast, and caps the coal formation of Tyrone and Monaghan. Having already noticed in our last conversation the basalt and greenstone of Antrim, we will now only notice them in connection with the tests of the various kinds of stone found in Ireland, so beautifully shown by Dr. Kane, as follows:—"The ordinary limestone of Ireland weighs in average per cubic foot 170 lbs.; the extremes of weight were 159 and 180 lbs.; the average weight of water which it absorbed by immersion was 1.4th pound; the greatest absorption was ½ lb. of water. The chalk of Antrim weighs 160 lbs. per cubic foot, and absorbs 3 lbs. of water. The impure shaly calp weighs 160 lbs., and absorbs from 1 to 4 lbs. of water per cubic foot. The average weight of sandstone is 145 lbs. per cubic foot; the extremes are 123 and 170 lbs. The absorption varies from nothing to upwards of 10 lbs., the average being 5½ lbs. Granite averages per cubic foot 170 lbs.; its extreme weights were 143 and 176 lbs. The granite of Newry and of Kingstown absorbs 1.4th lb., that of Carlow from 1½ to 2 lbs., and of Glenties, in Donegal, 4 lbs. Basalt weighs from 171 to 181 lbs. per cubic foot; the average is 178 lbs.; it absorbs less than 1.4th lb. of water per cubic foot. Clay roofing slate weighs from 174 to 179 lbs.; in average 177; the absorption is less than 1.4th lb. The soft clay-slate from Bantry absorbs about 2 lbs. In resisting fracture it was found that the slate-rocks were the strongest, and of these some were stronger when the pressure is applied on the edges of the cleavage planes than on the faces. The basalts are next in strength, then the limestones, then the granite, and the weakest are the sandstones. Considered in relation to a crushing force the basalts are found to be the strongest stones, next the limestones, and successively the slates and sandstones. In the different varieties of limestone some of the larger crystalline stones and the compact hard calp are the strongest. The light coloured crystalline stones of Ardracran and those around Cork are the weakest. The Connemara white marble or primary limestone is the strongest that has been found. The strongest sandstones are the red rocks of the South and the hard quartzose grits of the North of Ireland. Among the weakest are the County Down quarries, and the sandstones of



Antrim and around Clonmel, and some of the coarse quartzose sandstones of Donegal. From trials of the slates Mr. Wilkinson found those of Valentia to resist less effectually than those of Killaloe, and those of Mr. Synges quarries in Wicklow, are about intermediate. From the experiments on granite, with regard to crushing force, no positive conclusion can be as yet drawn, but Mr. Wilkinson finds it not to possess any superiority over many of the stones in ordinary use. Clays of every description from the coarse variety for brick-making up to the finest china-clay are obtainable in Ireland. As to the quantity of fire-clay and other varieties they are practically inexhaustible.

SOX.—Ireland is, indeed, a country of vast industrial resources; but before I go, father, you said the Cappagh Mine, in Cork, had barytes for a gangue, but I saw in the *Mining Journal* a letter from a resident of 40 years that there is no barytes there.

FATHER.—I did not say the Cappagh Mine, but the Cappagh Mines, meaning the group had barytes partly for a gangue. Will anyone deny that there is barytes at Ballycummisk, adjoining Cappagh Mine? I have no mind to misrepresent any place, but will do justice to all. My object is to show you the other as well as the bright side of Irish mine. It does not, however, detract from the richness of the mines that they contain barytes.—*New Cross, London, March 30.*

#### BALLYMENA AND LARNE RAILWAY.

SIR.—Some weeks ago you did me the honour to insert a letter calling attention to the neat little bit of very narrow gauge Irish railway recently constructed between Ballymena and Larnie. Its main object is to tap the great traffic flowing into Larnie from America, and to open up the Antrim iron ore district. The results are pleasing. The traffic is considerable, and rapidly increasing. The directors had earned enough to have paid a dividend last January. Rightly or wrongly they have retained the money for the present, so that a handsome dividend may soon be hoped for. Irish depression and general local distress have driven the 101. shares down to 71. I have invested what I can afford. Let others do likewise, for the present price is very low when the *bona fide* nature of the concern (presided over by a wealthy Irish landowner, Mr. Chaine) is considered.—*March 27.*

LOOKER-ON.

#### MINING IN SPAIN.—ASTURIAS.

SIR.—The importance of the vast mineral resources of these provinces cannot be over estimated. In crossing the Pyrenees from the Buzondog station by diligence to that of Pola de Lena the steep mountain sides, with the pleasant intervening valleys, delight the *voyageur*; and when he is capable of estimating the mineral wealth of the frowning rocks, which rise on every side, he is still more pleased. After an hours progress over an ill-attended and badly stocked railway, even for this country, along the margin of a river, with the hills rising abruptly on each side, we reach the station of Mieres, near to a well laid out ironworks, from which the station takes its name.

These works obtain the material from its own ironstone mines, which are scattered over that part of the province which lies between Oviedo and the foot of the mountains near Pola de Lena. These mines are very abundant, their produce yielding an average of 48 per cent. of metallic iron, being free from sulphur and phosphorus; and although they contain a rather high percentage of silica, when mixed with a portion of Sommorostro Campinil ore, imported through Gijon, and conveyed hence by rail to these works, they produce an iron noted for its ductility, and highly prized by all who use it. The requisite fuel is also brought from the mines in the district belonging to the owners of these works. Asturias is rich in coal: the whole of the district from Pola de Lena to Gijon, and from Laviana to Tineo, is one vast coalfield. The crops come to the surface at an angle of about 20° out of the perpendicular. There are a vast number of mines taken up from Government by holders in the locality, but only a few are being worked. Those that are opened are being worked in a very original manner. Advantage is taken of the accidents of the ground, a crop found at the side of a hill, and work is commenced by cutting out coals from the crop, as near the top of the hill as practicable. This is generally done, in order to avoid any outlay in the shape of dead work, whilst the coals have to be carried from the top to the bottom, often in sacks, on the backs of horses and mules. Timber is abundant, and not expensive.

In following the mineral railway from Gijon (the shipping port *par excellence* for Asturian coals) to Langreo, the mode of working collieries in this country is illustrated to the full. That there is a most excellent steam coal here is not to be doubted, since trials effected with it in the Spanish Navy, in competition and in comparison with that of Cardiff and Newcastle, have had the effect of inducing a contract for its supply for marine uses; and, further, excellent gas, locomotive, and coking coals are cut and utilised for their respective purposes. The fault of the Asturian coal lies in the fact that the whole is extracted from workings too near the surface, and that whilst it might in quality compete with those of England and Wales even, if cut out from a greater depth, that which is at present cut contains deleterious surface filtrations, and has amongst other matters a quantity of iron, which causes the fuel to clog on combustion, and causes it in the stock to turn a dirty brown colour after a short exposure to the atmosphere. Asturian proprietors will not see this, or if they see it they merely shrug their shoulders, and terminate any discussion on the matter with their customary "Si, si, pero que quiere va."

At Sama, a village in the Langreo district, we come to the Fabrica de Duro, another model ironworks, with four blast furnaces, supplied with material in the same manner as that of Mieres, with its streets of workmen's cottages, its cafe, and theatre. These cottages, though very far inferior to those of the kind in our Black country in tidiness and cleanliness, still are built on nearly the same model, and when compared with the so called farm houses and palaces of the country are palaces indeed. The River Nalon supplies this place with an abundant supply of water throughout the year, and supplies too an abundance of excellent trout and pike of large sizes, and salmon during the season.

Following the bed of this river towards its source for a distance of 10 kilometres over a good Government road, which, though rather winding, has the advantage of being nearly level, we come to Laviana, a very pretty and averagely clean town, containing a good hotel, where one may indulge in creature comforts with a relish, after the discomfort and filth amongst the mountains. Here there is a weekly fair and a market held, which brings in the villagers with their cattle and wares for sale, and to supply their wants, from a distance around of often 3 leagues, the whole of which distance they walk in the indigenous wooden sabots, known by the name of "madrenas." These are of a very clumsy construction, being fashioned out of a block of wood, without any piecing or fitting, further than to the extent of a space being scooped out of the centre, as a place for the foot. One pair has to last a year, and costs the equivalent of 1s. per pair. This town has a cafe and casino. The river supplies an abundance of fish, and the mountains frowning on either bank supply large and small game. During winter the Pyrenees brown bear is often seen, wolves are numerous, chamois abundant, the lynx and fox troublesome to the barn door broods, and eagles, goshawks, and vultures hungry and bold; whilst partridge and plover, woodcock and snipe, wild boar, hare, and coney, can generally be met with whenever they are looked for. There are a few ironstone and coal mines near this place, whose output is consumed by the Duro Works. Ascending the banks of the same river a further 4 kilometres we come to a small village on the left, called El Condado, and on the opposite bank another, called Soto, both noted for being remarkably dirty. They are situated at the foot of a cross chain of mountain heights, which rise to the height of nearly 3000 ft. from the river banks, and run in a northerly to southerly direction, continuing through the north-western part of the province of Leon. It is in this range that the celebrated Profunda cobalt mines are found. On ascending and examining these heights from the village of Soto it can be seen that the geological formation here is identically the same as it is at Villamanin, distance as the bird flies about 30 miles, being a vast upheaval of mountain limestone, and this underlying stratification of dolomitic limestone, and dolomite of the

triassic formation. As might have been expected, minerals are abundant. Over a superficial area of more than 200 square metres in the Adelina mine, taken up from Government, and which lies within 1 kilometre of the village of Soto, there exists a surface sprinkled throughout with oxides of copper.

Workings were commenced some 12 years ago in eight distinct spots, all of them having copper ore in their sides, roof, and floor, but none of them have reached a greater depth than 20 feet, all dying a natural death, in the absence of energy and perseverance—virtues which it must be confessed are not often met with in Spanish miners: they work so long as they have existing contracts on the spot, but if the contracts are terminated few continue working, for the simple reason that they can find no outlet for their produce; or, again, a small outlay is required for deadwork. The miners, and even mining companies, are poor, generally devoid of capital. So long as they can extract sufficient produce to pay their way they continue; so soon as there is a call for working in sterile they stop. Thus it is that in this province no mines are worked other than on the surface. In addition to copper ore we find calamine nickel in small patches, and black oxide of cobalt in this course. Further south along this range there is cinnabar, and works have been erected, which promise well, and which to the present have produced several important parcels of mercury: the last exported, about 20 tons, having been shipped from Gijon for the London market during the last month.

Following the range north from El Condado, a distance of about 12 miles, we come to the celebrated Picos de Europa, a diagonal chain of lofty peaks, containing the most celebrated calamine mines that to the present have been met with in this country. In this chain also platinum (with some of its accompanying rarer metals) is found, and in addition cobalt, antimony, copper, and galena, whilst here and there jet of a very superior quality is extracted. Manganese of good quality, free from lime, is worked out of the hills around. Cangas de Onis, and from thence to the seaports of Villaviciosa and Rivasdella immense deposits of ironstone are met with, which, however, are worked on a very limited scale, though high in iron, because the greater part of these deposits have in their composition sulphur and phosphorus. No mention is made of ironstone in the range that passes by El Condado, although there is an abundance, since it is not utilised, owing to the cost of transport to any available spot. Some of the foregoing districts are being worked by Spanish companies, but far more could be done, and districts not yet opened only require the skill and limited capital of any who have practical enterprise in their constitution to insure such results as have seldom yet been met with in the mining world. Foreigners would on arrival here have to put up with many inconveniences, and for the nonce forego many comforts, but a small outlay would procure all they could desire. The scenery amongst the mountains is grand, the climate healthy and invigorating, game and fishing abundant, and the subsoil rich beyond all description. In fact, this province appears to have been specially fitted for Englishmen.

As the gold fields of the western part of the province are extensive they will form materials for another paper. J. A. JONES.  
*Gijon, March 25.*

#### CHILI COPPER.

SIR.—Permit me to enquire, through the medium of your valuable Journal, if it is a fact that the bulk of the copper in stock is being quietly absorbed by a syndicate of powerful capitalists? Relatively this metal is very cheap as compared with others, and far below the average price at present, but if the rumour above referred to is correct, no doubt it will soon be very much dearer. SUBSCRIBER.

#### COPPER MINING IN ARIZONA

SIR.—The eastern capitalists of America, I am glad to observe, are beginning to turn their attention to the valuable copper deposits in this territory, which, so far as I have been enabled to observe, are second to none in the country, not even excepting the far-famed Lake Superior Mines. In fact, during an experience of over 30 years in England, Chili, Germany, Serbia, and the Pacific States and Territories, I have never met with such an abundance of richer copper mines in so limited an area. In the detached mountain ranges, commencing in the centre of this territory, and extending far into Sonora, particularly along the banks of the Sonora river, and in the Montezuma district, a belt of copper is found of extraordinary richness, chiefly in an oxidised condition, which cannot fail to yield large profits when properly developed, and the recent advance in the price of the metal will, in all probability, stimulate activity in this direction.

My attention was lately called to a valuable group of these mines in the Santa Rita Mountains, about 30 miles south of this city; and as this may serve to convey an idea of the character of this kind of property, I will give a brief description of them. The group consists of 17 mines within a radius of 1½ miles—veins varying from 1 to 70 ft. in width, most of them running from 5 to 15 ft., the ore in a siliceous matrix chiefly in the condition of carbonate, silicate, red oxide and glance, in a fine condition for treatment by the Hunt and Douglas process of reduction.

From numerous assays I have made on samples of selected and averaged ores, the following results were obtained:—1. Average of 5 assays selected ore, taken by Mr. B. Virgin, one of the owners of the property, 35 per cent. copper.—2. Average of 13 assays, unselected, taken by the Hon. J. M. Kirkpatrick, 25 per cent. copper.—3. Average of 17 assays, unselected, taken by myself, 23½ per cent. copper.—4. Average of 12 assays, unselected, taken by the Hon. J. M. Kirkpatrick, 20½ per cent. copper.—5. Average of 15 assays, taken as careful averages by a gentleman in treaty for the purchase of the property, 20 per cent. copper. The individual assays ranged from 10 to 40 per cent., so that with the customary moderate selection at the dump a quality of 25 per cent. may safely be calculated on to supply the furnaces or lixiviation works.

There are two good springs of water on the mines, and wood can be delivered at \$4 a cord. An abundance of Mexican labour can be had at \$1 a day, and as three railways, now in course of construction, will shortly approach within 10 or 15 miles of this district, it will be readily seen that an extensive and profitable reduction establishment may be supplied from this source alone for many years to come.

During the assessment work which has just been performed an interesting discovery of silver-lead (carbonate) was made at a depth of 10 ft. in one of the largest of these mines—the Ben Virgin—interstratified between two layers of rich copper ore, 1 ft. on one side and 2 ft. on the other, the carbonate in the centre being 4 ft. in width; assayed in silver \$37.70 and \$95.81 per ton; a sample of copper ore from the same lode also gave \$15.71 in silver to the ton, which may be profitably extracted by the Hunt and Douglas method of reduction, although it would be lost—i.e., not paid for if smelted with the copper, no silver under \$30 per ton being allowed for by copper smelters. Disregarding for the moment the silver, which may nevertheless develop into a most valuable branch of the property, and confining our attention to the copper, it will be seen that with a Hunt and Douglas plant (this process for many reasons being preferable to smelting), capable of operating on 20 tons of ore per day, an output of 5 tons of copper may be calculated on, which, at the present price of 24 c. per pound, will be worth \$480 per ton—\$2400 per day, or \$720,000 per annum of 300 working days, on which I firmly believe with proper management a profit of 100 per cent. may be realised.

The profits of copper mining and reduction are much greater than is generally supposed, and are very apt to be overlooked in the glare of the more seductive operations in gold and silver mining. During the late depression in the copper trade, when the price in England fell as low as 53½. (\$265) per ton, it seemed inexplicable to many outside observers that the metal should still continue to pour into the market from abroad in undiminished quantities, while the Swansea (monopolist) smelters loudly proclaimed it was only being produced at ruinous rates—the fact being that since the introduction of recent improved methods of reduction by the wet processes, particularly the Henderson and the Hunt and Douglas, the foreign producers were working to a good profit, and rather increasing than diminishing their output. The beneficial effect of the late advance in price is, therefore, obvious, and needs no further comment. I may here mention, as an illustration of what has been accomplished in the way of

cheap reduction, that the largest copper company in England (the Tharsis), who have paid upwards of \$1,000,000 per annum in dividends, have produced their copper from 3 per cent. ore, which besides had to be imported from Spain, and in Serbia three years ago I worked 2½ per cent. ores to a good profit by means of the Hunt and Douglas process.

Returning to Arizona and the advantages to be derived by investing in its copper mines, another inviting feature presents itself in the manufacture of bluestone (sulphate of copper), an article that must be largely consumed on the spot in consequence of the extraordinary development of our silver mines, the ores of which are mostly being reduced by wet crushing, requiring from 3 to 10 lbs. of bluestone per ton. It is at present imported from San Francisco at about 15c. per pound, but can be manufactured here at from 5 to 8 c. according to the method employed—i.e., either by a sulphating roast in one of my patent furnaces (specially designed for the purpose), as by a product in connection with the Hunt and Douglas method of reduction, or by treating the oxide of copper, as prepared by the Hunt and Douglas process, with sulphuric acid.

The process is exceedingly simple, as will be seen by the following brief outline:—The ore is first crushed dry by means of Cornish rollers or other cheap and effective machinery to a fineness of 16 to 20 to the linear inch, and then submitted to a sulphating roast in a Rickard furnace. The roasted ore is then thrown into tanks, and the sulphate of copper (usually amounting to about 30 per cent. of the assay contents of copper) dissolved out with hot water to the saturating point, filtered or decanted, and then conveyed to the crystallising vessels, when after cooling about two-thirds the weight will be obtained as crystals sufficiently pure for the market. The mother liquor draining from the crystals contains sulphate of iron, and is valuable for making the bath or solvent (prochloride of iron with an excess of salt) used for obtaining the copper from the undissolved oxide. By this method of operating the bluestone can be produced at from 4 to 5 c. per pound, but should the ores be different in sulphur to work this process to advantage, sulphuric acid must be added to the oxide, which will enhance the costs to about 8 c. per pound, still leaving a handsome profit on the operation. As 1 lb. of copper produces about 4 lbs. of bluestone the augmented profit arising from this by product is very considerable, the composition of sulphate of copper being—

Copper .....	32 parts	} = 40 parts oxide of copper
Oxygen .....	8 "	
Sulphuric acid (dry) ..	40 "	} = 49 " liquid
Water .....	45 "	
125 bluestone		

The consumption for Arizona may be taken at about 1 ton a day at present, but this will increase rapidly as the development of the silver mines proceeds, and a large demand may also be calculated on from the neighbouring mines in Sonora. W. T. RICKARD, F.C.S.

*Assay Office, Tucson, Arizona Territory, U.S.*

#### RUBY AND DUNDERBERG CONSOLIDATED MINING COMPANY.

SIR.—I trust you will allow me the opportunity through your valuable Journal of making known to the shareholders of this company the particulars of the discovery of ore in the Dunderberg Mine, of which a telegram was received by the board, and published on the 11th instant. I do so by handing you herewith copy extracts from letters of Mr. R. Rickard to myself, dated Eureka, March 8 and 11, which I shall be obliged by your publishing along with this. The precision with which Mr. Rickard's recommendations (contained in his report of June 2) have met the success he then predicted reflects great credit on that gentleman, and goes to endorse his already high reputation as a mining engineer. W. A. MALCOLM, Chairman.

—R. Rickard, March 8: I have the good news to tell you that ore has been struck in the Home Ticket cross-cut. What quantity there will be we cannot yet say, but it looks strong, and the full face of the drift is in ore. We will develop it as fast as we can, and keep you well posted as to the progress made. On Thursday I will again go to the mine, and if I find it is opening well I will cable you the extent it has been developed. This ore would have been encountered before if we were able to commence work on that portion of the mine, but the 500 drift took longer to clear out than was anticipated. You will remember that this is the result of the work recommended in my report of June 2 last. The good feature of this new strike is that the ore is in virgin ground. No work has been done in this direction in any of the upper workings, and I am strongly of opinion that the mine lies out in this direction.

—March 12: I confirm my letter to you of the 8th instant and my cable, informing you of ore being struck in the 400. The ore was struck in the westerly cross-cut towards the Home Ticket ground, and I am glad to say it looks very favourable to open out to a good size body, and the ore is of very good grade. It is undoubtedly the Home Ticket ore, the nature of it being precisely the same. The fact of striking any ore on this level goes to show that this portion of the company's ground is mineral bearing, and I have no doubt in my mind that there will be large and profitable bodies of ore found in this ground. In following up the seams of ore on the old slopes in the 300 ft. level we have a very good prospect of finding some good ore. Taking it altogether the mine is looking very well, and I hope that soon we shall be able to defray all expenses, and leave a handsome profit.

#### NEWPORT ABERCARN BLACK VEIN STEAM COAL COMPANY.

SIR.—In the upward movement in value of all sound and *bona fide* coal and iron shares which has taken place during the last few months I have been somewhat surprised that the great and intrinsic value of the above property has been so singularly overlooked. The month of March closes the financial year of the company, and which I am credibly informed will show most satisfactory results, and enable the directors to declare their first dividend, which, considering that 4573½. balance of profit was carried forward from 1879 to current year's accounts, should be a good one. When the year's accounts are published there will doubtless be increased attention paid to the shares, which should cause a sharp rise in value. As this company's shares cannot fail to become a popular medium for investment a few particulars relating to it may not be uninteresting to your readers. The company was formed in 1873, and the sinking of the shafts, &c., took five years to accomplish. The estate comprises 1200 acres of coal, with seven seams, varying in thickness from 2 ft. 4 in. to over 8 ft., covering the whole area, and representing over 35,000,000 tons of coal. Its close proximity to the port of Newport (Mon.) gives it an advantage of at least 1s. per ton in freight when compared with several of its largest competitors, such as Ebbw Vale, Tredegar, Merthyr, Aberlure, &c. The usual mineral leases in South Wales are usually 50 or 60 years, but this property is secured by lease for 99 years. The output has been 6000 tons per week, and can be still further increased. It appears to writer that there are all the essentials here for a permanent investment that should return on the average at least 10 per cent. on the capital employed, or even more, as it is one of the most complete and best appointed collieries in the kingdom, no expense having been spared in its equipment with machinery, &c. The shares at the present moment instead of being at a discount ought to command a handsome premium, considering the permanent character of the security, and its brilliant prospects. X.

#### BROKERS' ADVICE

SIR.—We trust you will allow us space to make an appeal to our brother dealers and brokers on a point of importance to our respective clients and selves. We allude to the very careless manner in which advice is too often given respecting mining investments. As an example we may quote the following extract from a letter which one of our friends has just received from a very respectable broker in this city:—"I cannot advise you to buy South Prince of Wales shares, as I know nothing of the mine. I consider Prince of Wales shares cheaper at 14s." Now, a reference to your own columns for the past fortnight would have enabled this broker to have known a great deal about the mine, so we suppose he is not one of your readers, or at any rate he does not seem to keep himself very well posted up in what is going on in the mining world. But, be this as it may, he goes on to stultify himself by saying that he considers shares in a neighbouring mine cheaper. The price he mentions for these is 14s., or nearly 100 per cent. premium, although the mine is not paying its way, and in spite of the shareholders' liability being unlimited. Some very good reason ought to exist for describing such shares as cheaper than South Prince of Wales (Limited) at par; but



when we seek for such reason we find the brokers "knows nothing" of the latter mine. Why, then, should he offer an opinion? His duty is to give his correspondent the best advice procurable, and if he knew nothing about the subject-matter to make enquiries before giving an opinion. We are sure that all fair-dealing men will agree with us in this, and so, on reflection, will the very broker we criticise. The incident is typical of the "irresponsible frivolity" by which investors frequently suffer, and which all of us who assume to guide the public ought certainly to eschew. In writing thus we do not forget that most shareholders are interested in special mines, and prefer to see these rather than others stand well in the market; but this object need not be attained by disingenuous methods. If a little more cordiality were prevalent in our market, and if all would co-operate in pronouncing judgments upon mines strictly according to their intrinsic merits or demerits, we should all of us be the gainers. Worthless concerns would soon be weeded out, and the market price would ere long be a true criterion of the value of the shares, whereas at present this is very far from being the case, and a vast number of investors are consequently deterred from securities which, founded as they are upon the principal basis of our national prosperity, ought to rank in the very highest class.

Cannock-street, London, April 1.

P.S.—We must not be understood as wishing to disparage Prince of Wales shares. On the contrary, we think well of the mine, and have for some time past recommended it to our clients.

#### CORNISH TIN MINES, AND MINING.

SIR,—It is most refreshing to peruse the highly satisfactory balance-sheets issued to the shareholders of many of our Cornish tin mines, and as the present prices of metallic tin are 92½ ingots, and 94½ refined, the reaction has probably attained its lowest pitch; hence probably, after the general election, and the trade and enterprise of the country resume their normal condition, prices will strengthen, and thus the future of tin mining is both encouraging and healthy. Many copper mines after yielding vast returns and thousands per cent. upon expenditure of capital in dividends, have in depth changed to tin. Amongst others may be enumerated Levant, Dolcoath, Carn Brea, South Frances, West Basset, East Pool, and Phoenix. Of these two—East Pool and South Frances—held their audits on the 22nd inst. The first-named showed profits of 7333½, and a dividend of 22s. 6d. a share was declared—i.e., 230 per cent. for the quarter.

The Chairman at the meeting observed that the number of shares up to 1869 was only 112, and that the dividends were 31, spread over the previous seven years. For the last ten years there had been 32 dividends paid, on 6400 shares, 9s. 9d. called up. This mine was first discovered by the late Capt. Nicholas Tredinnick about the year 1834, since which the capital subscribed has been recouped thirty-eightfold, and the last dividend was at the rate of 920 per cent. annually. The shares command a market value of 6000 per cent. Forty-five years ago the shares, 5½, paid, sold for 525½ each, equal to 10,500 per cent., nor was this quotation out of character, although somewhat inflated, as the present market value added to the dividends spread over the period amount to about 10,000 per cent.

South Frances audit for four months showed a profit of 3601½ 19s. 1d. (say) 10,805½, or equal to about six years' purchase at 15½ per share. It should be borne in mind that 202,000½ were divided as profits on an outlay of 9393½ from copper ores raised from the upper sections of the veins, and should this mine, like Dolcoath, the richest tin mine in the world, increase in riches as depth is attained, present quotations bear no comparison with prospective prospects, coupled with inherent and expansive value.

Levant gave over 2000½ dividends per share from copper ores. The financial position is satisfactory, and the yield of tin is such as to warrant the early resumption of dividends. Again, Wheal Owles some 12 to 18 months ago had no market value, the shares were 80 in number only, yet owing to the revival of trade and the enhanced standard for black tin the price of the 80th share is equal to 175½. Thus has a lame duck become an active falcon from the simple facts of practical management, firm reliance in the value of tin regaining its normal standard, and the pluck of the pursuer in stocking tin ores instead of selling at depressed and crippling prices, which exhausted the resources of so many promising mining companies, ending in grief, over the period 1874 to June, 1879. When trade revived in this country, through the demand in America for iron and other metals, which reflected on British industries and led to the revival of trade, industrial employment, and the expansion of our iron and coal products. These, the backbone of every other pursuit, gave impetus to the pent-up energies of the speculative and enterprising spirit of England, and hence sprung the glowing hopes in the future, and which already have wrought such favourable changes in every centre of industry throughout the length and breadth of the land.

It is not my intention to enlarge more fully than necessary on this interesting subject—the tin mining of Cornwall; but I should be most negligent were I to omit reference to the practically and economically worked and profitable mine called Wheal Eliza. There is no heartburning or defaulting Stock Exchange dealer associated with this property. There is not even a quotation for the shares, and the proprietors are satisfied with profits which cannot fall far short of 75 per cent. annually. This company is mining, and not jobbing in shares. Again, there is Wheal Pecvor; this is a prize of sterling worth, well handled, and likely to expand.

It is not most important to investors to have pointed out those mines which have rewarded others for their outlay, as purchases at present, or rather market prices, are based on established value, and heavy premiums will have to be paid for shares. Hence the inherent worth is generally discounted in market quotations, and investments are to be made only after earnest and searching enquiry into the prospective merits of the respective properties. It should be remembered that the past is gone, the present is not always in mining to be relied upon, and the future alone should interest the capitalist—i.e., pioneer points of operations, number of lodes, their proximity and their dips, directions, and junctions, existence of cross-courses, slides, elvans, strata; their crystallisation and varied natural phenomena, known well to the student of the "Science of Investments" and all practical miners; added to which regard should be paid to amount of reserves, whether monthly increased or diminished, time required in development, costs of prosecution, and the chances of success when realised.

In the face of the foregoing observations we venture to introduce to the notice of your readers the following two important mining properties about to be incorporated as limited companies upon such favourable terms to investors as cannot fail to well remunerate them for the capital embarked—the East Eliza and West Wheal Towan Mines, two of the most sterling and valuable tin properties introduced to public notice during the past decade. East Eliza is in the north and south parallel of Lanescot, which yielded the talented and late practical miner, Mr. Treffry, some 250,000½ profits. It is west of Fowey Consols, and traversed by the same lodes which yielded some million sterling to the same gentleman over a period of two decades. Par Consols is also adjacent, and gave some 300,000½ dividends. In the same group stands Crinnis, East Crinnis, and Pembroke, with Wheal Eliza westward, to which reference has already been made. The East Eliza is already very successfully proved to be rich both for copper and tin, and there can be little doubt that 1000½ to 1500½ will open out a property worth 50,000½ to 100,000½. There are six lodes within a space of some 30 fms., and these can be opened out to a productive depth through extending an adit level, and wholly without the aid of steam pumping machinery. The chief outlay will be in dressing and ore returning machinery, floors, and the varied paraphernalia of tin and copper manipulation and cleansing of ores for market. This piece of ground so eagerly coveted has for high a half century been locked up in the hands of parties who knew the intrinsic value, but lacked the means to work and develop its minerals.

West Wheal Towan is divided into 1000 shares of 25½ each, 20,000½ of which will be working capital, and is double the estimated costs of reactivating the workings, and rendering the property remunerative. The mine is most favourably recognised by the press of Cornwall, and various practical miners and experts. Mr. Henry Dale estimates the yield of tin at 25 tons a month as soon as the water is

drained out. Stephen Davey, of Wheal Kitty, states the productive tin ground already discovered and laid open at 200 fathoms in length. Nicholas Bryant at 180 fathoms. The late Captain Tonkin, 40 years tributor and agent at Dolcoath, 150 to 180 fathoms; while each and all concur in the existence of four lodes, and that only one has been very partially developed. The rich lodes of Wheal Towan traverse the set, and there can be no question when in full force of development that a yield of 50 to 100 tons of black tin will be made monthly, worth 3000½ to 6000½. This mine is an important one, the chances of brilliant success many; but, like all great prizes, industry, talent, and practical management, with money, the sinews of war, are required to achieve success. The money proposed to be raised is amply sufficient for all purposes of machinery, drainage, development, and dressing appliances. The buildings at surface, and the work done in sinking four shafts and opening out levels, are worth fully 10,000½ to the present company, and though the yield will be some 1500½ monthly, or as soon as the water is out, the returns will augment regularly for the next decade, and until the mine becomes as extensive and remunerative as the best in Cornwall. *Nil desperandum* shall become our motto, and we trust to intelligence and perseverance as our harbingers to success.

Mildmay Chambers, London, March 31.

R. TREDINNICK,  
Consulting Mining Engineer.

#### WHEAL UNY.

SIR,—I have partly accomplished my object in writing my former letter by getting a reply from Capt. Rich, and I can quite understand his wrath at anyone attacking such a close borough. Does Captain Rich imagine that he can suppress the facts as to the position of the mine? Allow me to tell him that there are too many eyes and ears open, and that the time is passed for such arbitrary rule. The fact is, it became a question who should bell the cat. This I assure you is no easy task, and I chose to write as a miner to set the ball rolling, and provoke a spirit of enquiry. I still assert that the levels in Wheal Uny have been driven for years off the lode. I ask Captain Rich is he driving in the lode, the 140 east, or is there a particle of tin in the level? That model of mining the 150 is a pattern for the inspector's eye, and is a standing evidence of indecision. There seems to have been a notion that there was something wrong there, and it is driven much like a stairs placed on its edge. This level is now used, by which the stuff from the new discovery is brought from King's to Gooding's shaft, about 40 fms. in wheelbarrow. This is progressive mining in 1880. The level in which this is being done is in such a wretched state that it will not take a tram-wagon. I ask whether the 160 fm. level was driven in the lode, and is not the whole of the stuff from this level east thrown away as waste? He says that he is driving in the best part of the lode, as proved by sample. I doubt if he has seen one-third of the lode in width, and how can he possibly know which is the best part? We have here two levels within a distance of 24 ft. This may be called economy of labour, but I fail to see it. The unfortunate run at the shaft is what may be termed a preventable accident, and ought not to be passed over so curtly as Capt. Rich has done. I do not know if there is a log kept at Wheal Uny of the daily operations—if so the diary of the last three months would be an interesting study. I still assert that Wheal Uny is a most valuable property, and must not fall under the knocker's hammer. Mine adventurers are a forbearing and long-suffering race; but sentiment is one thing and one's pocket another—and if Capt. Rich three months ago had confessed his error, and boldly set to work to remedy it, the mistake would have been condoned, and confidence restored.

March 30.

#### WHEAL UNY.

SIR,—I see that Capt. Rich has replied to "Miner" in last week's Journal, and feels very indignant that he does not write in his real name, but does not attempt to refute any of his facts. Perhaps "Miner" has his reasons for writing in the way he has done, but I have no such scruples. I fully endorse all that he has said, and assert that the way that Wheal Uny has been worked is not creditable to anyone professing to be a mine agent. Capt. Rich denies that the 160 fm. level is being driven in the country, and says that he is carrying the best part of the lode. I tell him that I believe he has scarcely seen the lode in the 160 fm. level, and that the cross-cut is in only 8 ft. in a lode which in the upper levels and in the neighbouring mines is from 3 to 6 fms. wide, and is being driven partly in the mere crust of the lode and partly in the country. He seems to be afraid of cross-cuts and tributaries. These are the means by which mines are saved, and if he had done more of this there would not have been so much barren country in the neighbourhood. The run in the shaft he treats very lightly. If there had been proper supervision this would not have occurred, and allow me to ask him how often he has gone through the shaft during the last two years. Don't let my fellow-shareholders imagine I write to depreciate the property. The fact is, unless some one comes to the rescue we shall be continually getting calls. The mine properly worked could give good dividends. Wheal Uny is a splendid property, and I fearlessly say that there is more mineral discovered here than in either mine in which the great flat-lode is worked. Let us have the next meeting on the mine, and then gentlemen who have so bravely responded to the calls will see how they have been led for years, both in London and in Cornwall, when things concerning the mine could be discussed there, and I do not hesitate to say that the value of the property would be double in a very short time.

Bell Cottage, Lanner, March 29.

#### MUSHROOM MINES—"CAUTIOUS," AND EAST CHIVERTON.

SIR,—Anyone with common sense would have been only too glad to retire into obscurity after the justly merited castigation that "Cautious" has had. . . . Let me tell him that in this part of the country we do not consider it derogatory to a gentleman to "call a spade a spade," and if a man either tells a falsehood or insinuates one we do not scruple to brand him as he deserves. In his first letter he undoubtedly evinces both gross ignorance coupled with untruthfulness. The miserable subterfuge by which he evades Capt. Southey's direct charge of wilful untruthfulness needs no comment, and his fence with Mr. Sharp, by which he attempts to shift attention from the point at issue—his truthfulness as to the returns of lead from East Chiverton—to the construction of sentences and grammar is on a par with the rest. All I need say on the point is that his schoolmaster ought to be ashamed of him, as in his last letter every rule of good grammar is violated, while he entirely fails to vindicate his truthfulness. . . . The simple fact is that East Chiverton has just reached the 90 fm. level, about the point that West Chiverton became rich. East Chiverton is likely to prove a good speculation. "Cautious" wants to run it down, but does not know how; he does not scruple to grossly misrepresent, but lacks ability to apply it to the end in view. Now, as to his charge of "trap setting," I cast that back upon him as being true of himself, and with the knowledge that he has set his trap in vain.

As to myself, I am, as I said, a ten-years old shareholder in East Chiverton, and am, as no doubt are the bulk of my fellow-shareholders, quite satisfied with our property and to spend our money to develop its wealth; but, mark it, we have never paraded it before the public; in fact, the mine has been known lately to few but those connected with it ere "Cautious" obtruded it, and has been worked solely on its merits, and not for market purposes. Had "Cautious" been an honest man he would have (living, as he implies, in Cornwall) gone to East Chiverton and seen for himself, and if the facts of the case were different to what he stated—which they are—he would have at once corrected his former misstatement, but as he has not thought well to do so he must be content to take the consequences of his gross unscrupulousness.

One point more, Sir, and I have done with "Cautious"—that is, his despicable scurrilous slander on Capt. Southey; here he has not the manliness to make a direct attack, but insinuates—and no doubt, if he were brought to book, would again shelter himself behind some fence worthy of its object.

I am pleased to say that I have known Capt. Southey for the past ten years, and a more strictly honourable man I never knew. His

skill as a miner is openly recognised. As to his connection with West Chiverton, his services there were sought, not offered, and he has done his duty there since, with nothing to be ashamed of. As to Hultafall, it is not "his creature;" he was requested, and reported on it, and that report cannot be gainsaid. As to its management or the formation of the company, Capt. Southey had nothing to do with it. I shall not follow "Cautious" further than to remark that I think Cornishmen will not feel flattered when he lays, as he does lay, claim to kinship. As for me, I should be sorry to think he is an Englishman.

J. B.

#### GREAT DYLIFFE MINES.

SIR,—I am glad to find from the report of the above mines in the Journal of last Saturday that the sinking of the Llechwedd-du engine-shaft is being set about in earnest. I have known the mines for many years, and can confirm the statement of a previous correspondent as to the Llechwedd-du lode having been the means of considerably enriching Messrs. Cobden, Bright, and Co., when they worked the mines. Like other mines it has had to go through bad times during the last two years, but with good careful management has emerged from them in much better order than might have been expected, and it will, I feel confident, ere long again rank as one of the most prosperous mines in the country. It is about the largest mining sett in Wales, contains at least four masterly lodes, is well supplied with machinery and water-power for pumping, drawing, and dressing, and is undoubtedly the cheapest mine in the market.

March 31.

AN OLD MINER.

#### GWERN-Y-MYNYDD.

SIR,—This is a silver-lead mine in a celebrated mining district in Flintshire, a comparatively new venture, and keeps its 4½ shares pretty steadily at about 5½ or 6½. There is some evident mystery connected with the mine, and mining agents might do well to find it out if they can. People in its neighbourhood believe in it, and are said to be shareholders—a good sign. Though the mine has only been about a year in progress the sales of silver-lead, as recorded in the Journal, have reached over 1000½. It is most unusual in mining to obtain such early and excellent results. The direction is no doubt exceptionally good, and the very brief reports that the Journal gives from time to time contain all the elements of success that shareholders can desire. The mine is not far from Mold Railway Station. However, mining agents and reporters are not, I hear, permitted to visit the mine, and possibly in consequence, the shares stand at a comparatively low figure. . . . If my calculations are anywhere near the mark, Gwern-y-Mynydd is likely in a few months to prove one of the richest mines in England.

On a similar principle the Richmond Mine, to which I see attention is well directed in the Journal of this day, is quoted far too low. The Richmond Mine is one of the richest mines in the world, and could not be exhausted for years. The usual weekly telegram generally gives—"Week's run, \$52,000"—10,400½ sterling. Last week it was \$72,000 = 12,400½ sterling. Yet the shares are only about 13½, notwithstanding the coming dividend and bonus of 1½ a share.

March 27.

LOOKER-ON.

#### MINING IN CARDIGANSHIRE.

SIR,—The elections have undoubtedly called the attention of the investing public from mining pursuits, and will do so for some few days to come. It is, however, refreshing to read the report of the Bwlch United Mines in last week's Journal. Having in my recent travels paid a visit to the Principality, I can fully endorse all that has been said as to the prospects of these mines, and can add my opinion that much more could and ought to have been shown of the great merits of this property. Thousands of pounds sterling, more considerably than the present comparatively small capital of the company, have been expended, and it is patent that but for such expenditure the present company would not be to-day in its enviable position, and with three years capital at its back for further development, every level producing good orestuff for dressing purposes, and a moral certainty in a few fathoms sinking of striking the great ore deposits worked upon a few fathoms to the west, and continuous for 100 fms. in depth. Mining, as all practical men know, is a venture; if it were not so it would not be mining, and all energy for the search for minerals would cease. This searching helps and expands the activity of mankind, and often rewards those who have faith, and enter into it with pluck and prudence, to wealth and prosperity. It is a well known fact that often even a few strokes of the pick will reveal riches which reward the adventurers for years of toil and cost, whereas if they had been unsanguine men all would have been lost. Riches are not at the call of the magician's golden wand; to reap it is necessary to sow, and I do not know a better chance in mining than the Bwlch United. Those investors who have secured an interest in these mines will reap a harvest worthy of their spirit and enterprise.

TRAVELLER.

#### DEVON COPPER AND BLENDE.

SIR,—I note what your correspondent ("Another Shareholder") says in reply to my letter in the Journal, dated March 15. I beg to say that since then I have a letter from one of the first mining men in England who has been down the Collacombe Mine, which quite justifies my statement that there are thousands of tons of blende in the mine.—March 31.

SHAREHOLDER.

[For remainder of Original Correspondence see this day's Journal.]

#### FOREIGN MINING AND METALLURGY.

The Belgian coal trade has exhibited little change. The Liège basin has shown some feebleness. Orders are scarce, stocks are increasing, and prices are falling. The iron trade of Belgium is somewhat less active, and the Belgian coal trade has felt the consequences of this immediately. Several collieries have already ceased working on Mondays, and others threaten to follow the example. The Mons basin remains, however, much firmer than the Liège district, and does not suffer from the depression which prevails at Liège. In the Mons basin contracts for industrial coal can still be concluded at previous rates. Purchasers show little inclination to enter upon long-term arrangements, but still there has been no positive fall in prices.

The winter having at length terminated in France, the Paris coal trade has lost in a great measure the activity by which it has been distinguished for several months past. This remark especially applies to coal used for domestic purposes. Deliveries are now made freely, and the warehouses are filling up rapidly. Prices still remain at rather a high point, although they are tending downwards. There is not much change in industrial coal at Paris, prices being still fairly supported. In the basin of the Nord the coal trade has shown some heaviness, but this dullness is not expected to continue so far as industrial coal is concerned, as the season promises well for manufacturing establishments. The production of coal in France in 1879 was 17,104,485 tons, as compared with 16,960,416 tons in 1878. Of the coal produced last year 7,251,969 tons were extracted from the soil of the departments of the Nord and the Pas-de-Calais.

In connection with Belgian industrial affairs we may note that a new undertaking has just been organised under the title of the Malines Construction and Workshops Company. The share capital of the company has been fixed at 50,000½ in 2500 shares. A new company has also been formed under the title of the Belle Vue Forges and Rolling Mills Company. The capital of this company has been fixed at 16,000½. The Belgian iron trade still presents an undecided tone. Several establishments have not a sufficient number of orders, while others have their order books well filled, and will be occupied for some time to come. The Charleroi basin is better off than that of the Meuse. Prices are tending downwards upon the whole. The intelligence that an order for rails had been received on American account is confirmed; other American contracts are stated to be pending, but upon slightly lower terms. The Belgian Minister of Public Works proposes to shortly let contracts for 2000 trucks and 57 locomotives. The Cockerill Company has just lighted a fourth furnace for the production of cast-steel. In the course of six months two large furnaces which the same company commenced last year will also be lighted; each of these furnaces will produce 70 tons of cast-steel per day. In six months the Cockerill Company will be enabled to use 100,000 tons of Somorostro minerals annually. For



the purpose of removing these minerals the company is completing at present at Antwerp its fourth steel steamer, the *Altora*, of 1200 tons burthen.

The Thomas-Gilchrist process for the dephosphorisation of pig, which is about to be tried at Longwy, will be introduced shortly by three other French companies at Denain, Saint Chamond, and Nancy. Means will thus be shortly afforded of seeing this process at work in almost all directions. The French iron trade has been generally dull.

Amongst the various manufacturing industries which are being developed in the Southern States of the American Union it appears that an important place must be assigned to the iron industry. It was to be expected that the considerable expansion of the demand for iron manufactures in America, and the high prices obtainable in consequence, and under the protection of the heavy import duties, would result in new and important enterprises for extending the area of supply in the States themselves. The ironmasters of Pennsylvania are just now observing with deep interest a movement for utilising on an extensive scale the iron deposits of Alabama. A number of new furnaces and rolling mills are to be erected in that State. The scene of the operations is chiefly along the line of the North Alabama Railroad, which is a branch of the Louisville and Nashville Railway. A new rolling mill is already nearly complete at Birmingham, Alabama, and will be opened about July 1. Two other furnaces are rapidly approaching completion at the same place. It is also intended to open several coal mines in Alabama, to be worked in connection with the iron industry. The promoters contend that iron can be produced in the State in question much more cheaply than elsewhere, on account of special facilities, and that the cost for manufacturing No. 1 iron will not exceed \$9 to \$10 per ton, which will leave a large margin of profit at present prices.

#### REPORT FROM CORNWALL.

April 1.—It is almost idle to attempt to write any detailed report of the condition of mining enterprise, or indeed of any other business, in the present relation of the county, with a holiday week and a polling week coincident. Especially so in fact in this instance, when every borough in Cornwall, and one of the two county divisions, is being contested, with Devonshire very nearly in the same position. People are, as a rule, much too excited over party politics to pay much attention to the development of mining enterprise, but it is satisfactory to know that in its ordinary regular sense mining continues not only fairly prosperous but steadily progressive. Mining legislation will hardly have much influence upon the results of the election, for the only question raised in connection with it has been the stupid anomalies which now exist as to the employment of children; but some capital has been made out of a comparison of the course of the two standards under respective Governments. There has been a little talk, too, of protection against foreign tin, but with no result.

The suggestion was thrown out that Capt. Teague should be put up as a representative of the mining interest in West Cornwall, and probably he would have been a strong candidate (though certainly not against Sir John St. Aubyn), but from the fact that in East Cornwall, where he is a large landowner, he has thrown in his lot with the Conservatives, and that West Cornwall is very strongly Liberal. Mr. John Michael Williams was such a hearty supporter of Liberalism in the county that his loss at such a junction is rather serious to that cause. His son, Mr. Michael Williams, is, however, following in his father's footsteps.

Altogether so great has been the check to enterprise and development which the election has caused that many will be very thankful we do not as yet live in the days of triennial Parliaments. Once even in seven years is enough for such disturbance. However, we may hope now for a speedy renewal of activity.

It is quite as much due to the special dullness of the times as to any more direct and serious cause that the drop in the tin standards which was expected last week and then delayed, has come this. Probably we shall not see any recovery for two or three weeks, until the machine of Government has got fairly into gear and working order again.

The only change in the representation of Cornwall which in any way concerns Mining interests is the election of Mr. Brydges Williams yesterday as Member for Truro, in the place of Col. Tremayne. Mr. Williams has been a good deal concerned in mining matters, as a shareholder in smelting and as a partner in the Union Bank, and thus may fairly be said to succeed to the place occupied by Sir F. M. Williams, in the contest for the seat vacated by whose death he was beaten by Col. Tremayne, who now retires. Mr. Brydges Williams is a distinct gain to the business element in the House.

#### REPORT FROM NORTH AND SOUTH STAFFORDSHIRE.

April 1.—The near approach of the Quarterly Meetings, which are held on Wednesday and Thursday next, combined with the election excitement, together resulted in the gatherings of the trade yesterday in Wolverhampton and to-day in Birmingham, being the duller for a long time past. Whenever it was possible buying was deferred. It is not anticipated that there will be any declared alteration in the prices of iron next week, but the coalmasters of the Dudley district will, buyers anticipate, reduce furnace coal 1s. and slack 6d. per ton. Marked bars are nominal at 9s., and common sorts from 8s. down even to 7s. Plates were the same price as last week.

The Chillington Iron Company (Wolverhampton) report for the year ending with December shows a loss, including bad debts, of 6706s. The directors state that during the first eight or nine months of the year the depression in trade was more serious than they had ever previously experienced. The average selling price of iron during the year has been 17s. 10d. per ton below that of 1878, and the failure of customers involved a loss, in bad debts, of 2111s. The directors, however, state that a great improvement has occurred in trade, and they look for a continuance of the return of prosperity. Their works are now profitably employed. The company have, the report states, recently leased some long-established galvanising works in Liverpool, which are proving valuable adjuncts to their Wolverhampton manufactures.

Thirty ironworkers delegates representing South Staffordshire, East Worcestershire, North Staffordshire, Warrington, Shropshire, South Yorkshire, and Lancashire met at Wednesbury on Monday to take into consideration the advisability of forming an Amalgamated Association. It was determined to establish such a society, to be entitled the Associated Iron, Steel, and Tin Workers of the Midland Counties, with the central offices at Walsall. Upwards of 20 lodges have already been formed, with 1000 members. This number will soon be largely increased, seeing that the assembled delegates represented altogether some 20,000 operatives. The object is to afford trade protection in the case of disputes arising between individual works proprietors and their men which are not settled by the conciliation board, and also to provide social benefits in the shape of pecuniary aid. The subscriptions vary from 3d. to 6d. per week, according to the price paid for puddling, 3d. being the fee when puddling is from 7s. to 7s. 9d., and 6d. when puddling is 10s. or over. It is hoped that by-and-bye the North of England Association and the Midland Counties Association will become for all practical purposes one.

The miners of the Cannock Chase and Brownhills district at a mass meeting, held on Monday, were urged by Union representatives to join the Miners' Union, the number in this corporation having fallen from 8000 or 9000 a year or two since to 1000 at the present time. The following resolutions were passed:—(1) "That this meeting heartily approves of the steps taken by the district council in giving six months' notice to terminate the agreement entered into last April between the employers and the employed of the various collieries in the Cannock Chase coal field;" and (2) "That this meeting pledges itself to use every means to bring about a thorough organisation of all the miners in the Cannock Chase district as early as possible, and that no other agreement be entered into until that end is accomplished."

The Quarterly Meeting of the North Staffordshire Iron and Coal Masters' Association was held on Wednesday at Hanley; Mr. Wragg

in the chair. Trade was reported to be very quiet in all departments. Prices were easier both for ironstone and pig-iron, and in some cases for finished iron, which was perhaps partly attributable to the dullness which had come over the times in consequence of the general election. The coal trade in particular, was stated to exhibit a remarkable want of animation, and sales were pressed, and prices were drooping both in the manufacturing and domestic branches. A letter was read from the secretary of the North Staffordshire Miners' Association, reminding the employers of a promise to meet a deputation from the miners at the end of March on the subject of wages, and the Chairman's reply, stating that in the presence of an election he thought that it would be wise to postpone the meeting, as it would be difficult to get at present a representative gathering of employers, adding that the interests of the men would certainly not suffer by delay, as trade in every branch had gone back since the last interview of the deputation, although of course there was a possibility that after a time it would again revive.

As 'Change closed in Birmingham this afternoon it became known that the Earl of Dudley has just issued a circular announcing a drop of 1s. in coal and of 6d. in slack. Furnace coal now becomes 10s., and engine slack 5s. per ton. These are the prices which his lordship declared at the end of November last.

#### REPORT FROM NORTH WALES, SALOP, AND CARDIGAN.

April 1.—The excitement of the elections now pending eclipses every other subject. In Carnarvonshire and Merionethshire the slate quarries form a very important portion of the constituency. In the former county Mr. Pennant, son of the owner of the Penrhyn slate quarries, is one of the candidates, and the bulk of the workmen in those quarries sympathise on several grounds with the scion of the house. At all the other slate quarries, and the sett quarries, where domestic and local considerations are not uppermost, the bulk of the men seem in favour of the other candidate, Mr. Watson Williams, Q.C., who is able to speak to them in their own tongue. In Merionethshire the old member—Mr. Samuel Holland, one of the great founders of the slate quarrying enterprise of Festiniog—is opposed by a Mr. Dunlop, agent to Mr. Oakley, the owner of several quarries which as the leases have fallen in he has taken into his own hands. It is not thought, however, that he has any chance of success. In Anglesea Mr. T. Fanning Evans, Her Majesty's Inspector of Mines, is opposing Mr. Morgan Lloyd, the late member, much to the regret of his friends, who think that he is being misled by men less honourable and less transparently honest than himself. In the Flint boroughs the late member, Mr. John Roberts, who has a little interest in lead mining, is being opposed by Mr. Pennant, a descendant or connection of the accurate old antiquary and traveller Thomas Pennant. Mr. Pennant has the support of most of the local gentry, while Mr. Roberts is supported by the great smelters and chemical manufacturers, and is very popular with the mining and industrial population generally.

In Montgomeryshire Mr. Stuart Rendell, of the engineering firm of Armstrong and Co., of Newcastle-on-Tyne, is opposing the old member, Mr. C. W. W. Wynne, a cousin of Sir Watkin. In Shropshire, in the borough of Wenlock, Mr. A. H. Brown, of Druid's Cross, Liverpool, nominated by Mr. Geo. Maw, of encaustic tile fame, and Mr. W. G. Norris, managing partner of the Coalbrookdale Ironworks, is trying to wrest a seat from one of the old members. In Shrewsbury the old members, Mr. Robertson, the successful railway engineer, and principal owner of Plas Power Colliery, near Wrexham, with his colleague, Mr. Coles, has to face a strong opposition, and the result is by some considered doubtful. However, Mr. Robertson is not a man to be beaten very easily.

Our ready witted and practical old friend, David Davies, formerly railway contractor, and now colliery proprietor, was to have had a walk-over in the Cardiganshire Boroughs; but almost at the last moment an opponent has appeared. The opposition it is thought is not seriously meant, but only intended to draw Mr. Davies away from Montgomeryshire, where he has talked himself hoarse in making no end of slashing Welsh speeches on behalf of his friends; but the doughty old Welshman says it will make no difference to his movements. In Chester Mr. Urias Bromley, who is one of the owners of the North Hendre Lead Mine and of the Padeswood Colliery, and of the Flintshire Wagon Works, near Mold, is over head and ears in election matters. Mr. Bromley, who was a very successful commercial traveller before he took to mining, made a good hit at a meeting the other night. Mr. Raikes, one of the late members, who was a barrister, described Mr. Bromley as a "retired bagman." "Yes," replied Mr. Bromley; "we were both bagmen, and we both retired about the same time, when Mr. Raikes took to unsuccessful politics, and I to coals and successful mining." The improvement in the Coal Trade has been rather short lived. After receiving only three pence out of the advance of 7½ per cent. the colliers have been reduced to the old amount, in consequence of the reduction in the price of coal. Indeed, there seems to be some doubt whether even the old rates, low as they were, can be sustained during the summer months.

As noticed by a correspondent last week, there has been activity in prospective lead mining in Montgomeryshire of late, and we can hope that at least some permanently successful results will come out of it. We shall all be anxious to hear of the character of the new lode discovered at the Van, as well as to watch the progress on the Llechwedd-ddu lode at Dyffily. A new discovery of lead ore is reported from Erglodd and Penpompren Mines, near Talybont, and efforts are being made to attract capital for the resuscitation of these mines. In Carnarvonshire the reports of the great Gors lode do not seem to be so glowing as they were some time back. Coed Mawr Pool seems to have settled into silence. The operations of the Mineral Corporation seem hardly equal to the importance of the title. Of South D'Eresby we hear but little, and Llanrwst having reached a monthly output of 50 tons of lead ore is desirous of borrowing 10,000l.

#### REPORT FROM MONMOUTHSHIRE AND SOUTH WALES.

April 1.—The first stone of the new Swansea East Docks, carried out by the Swansea Harbour Trust, was laid on Wednesday. Some two or three thousand spectators had assembled in the vicinity of the new enterprise, which must have an important effect on the port from a shipping point of view. In the morning a luncheon took place at the Music Hall, and in the evening the Mayor (Alderman Jenkins) gave a ball at the same place. Apropos of the opening of this dock, it may be stated that at Newport there is no doubt that the Alexandra Dock will have to be enlarged. The vessels arriving are too much for the berthing capacity of this undertaking, and further extensions will have to be made. As for the iron trade of the district, the holiday season and the general election have been militating against the interest taken in the trade. As a matter of fact, the local works are as well supplied with orders as usual. It is satisfactory to be able to note that this district is by no means dependent on the American demand, but there are good orders also in hand for our colonies—notably India and Australia. For the latter country a much better demand is springing up. Masters' books are tolerably well filled up with orders at current prices. The rail demand has been about up to the average, and the quantity of this commodity sent away has been very large. Prices have not materially changed, except as previously stated, for pig-iron. A large clearance of rails has been made to British India. Bars are in better request on foreign account. Scrap-iron and crop-ends are in better request. Active preparations are being made to re-start the Hirwaun works. Spanish ore arrives in large quantities at the different ports. The tin-plate trade is firm, and the works are well employed. The coal trade also has not materially changed. Prices have not gone up, and there is apparently no material prospect of their doing so, for large orders have been taken at previous rates. The steam coal demand has been fully up to the average, but house qualities do not sell quite so well. Making allowance for the holiday season, shipments may be said to have been large. It may be mentioned that there is now lying in the Alexandra Dock, Newport, Mr. John Lancaster's (proprietor of the Nant-y-Glo and Blaenau Collieries) steam yacht *Red Rose*. She belongs to the Royal Squadron,

and is taking in bunker coal. The patent fuel trade is more active, and shipments have been larger, although prices have not been maintained.

#### TRADE OF THE TYNE AND WEAR.

April 1.—The Easter holidays and the elections have to a certain extent interfered with business. There will be little done at the manufactories this week, and considerably less than usual at some of the collieries. There are more enquiries from the Baltic, and a better prospect from the East generally. There is an excellent demand for good small and manufacturing coal, and business goes on very steadily with steam coal. The gas coal trade also shows an improvement in shipments. The steam coal rates are expected to be higher in April, but it is difficult to say what will be the result as to the extent of those advances at present. The competition with Wales and Scotland is very keen. The house coal trade continues dull; there is no improvement in the demand or in price for the North Country house coal in the Thames. It is understood that some of the firms here who supply the coal intend to secure wharves for the landing and sale of coal in the Thames if it is possible to do so, but the merchants who have possession of the trade will no doubt offer a most determined opposition to any movement of this kind. It is expected that some advance in the price of gas and coking and also manufacturing coal will be made in April, but to what extent it is still uncertain. The Durham miners expect to get some advance in their wages rates at the next settlement of the accountants appointed under the sliding scale. The coke ovens at the Felling Colliery, which had been out some time owing to the late depression, have been again lighted; the coal for coke making is worked from the lower seam, called the Busty seam. Several seams, including the famous Hutton seam, are worked at this old colliery, and a large quantity of coal—about 700 tons per day—is raised.

The progress of the iron and mineral and general trades of the district is clearly shown by the regular increase in the traffic of the North-Eastern Railway Company. For the week ending Saturday last the increase was 23,558l., as compared with the same week in last year. The increase in the mineral traffic was 10,853l. At the extensive engine-works of this company, in Gateshead, there is considerable activity, and the wages of some of the mechanics and others have been raised.

The iron trade has been very dull throughout the week in the North of England and Cleveland, the elections, added to the previous lull, considerably reducing business. The holidays are also a disturbing element. The quotations for pig-iron are very irregular, and are affected by the variations in the Scotch market. No. 3 is now quoted at 52s., and even less in some cases. The shipments to Scotland last week improved considerably. While Scotch iron only keeps 3s. per ton above Cleveland there will be very little demand for the latter in Scotland. The fresh demand for pig-iron is small. There is little enquiry for present or forward delivery. Consumers are as a rule carrying out a waiting policy. They will not operate until they are satisfied that there is likely to be a resumption of the demand from America. The manufactured iron trade is very quiet; except for plates there is little fresh demand for iron, but the works are very busy. The prices are not so good—ship-plates 8l. 15s., bars 7l. 12s. 6d., angles 7l. 15s., iron rails 8l. to 8l. 5s. The steel trade is busy, and it was announced at the meeting of the Darlington Iron Company that their new steel plant was just about to be put into operation. At these works iron-workers are scarce. There is less demand for coal, and coke has become much easier in price. Durham coke can be obtained at 14s. to 15s. at the ovens for early delivery, though coke makers refuse to sell forward at these rates. Coke is more plentiful than it was a short time back. Coal trade without improvement. The chemical trade is very quiet, but prices are steady, and a better demand for the Continent and for America is expected to spring up.

Election matters occupy the attention of everyone, though the contest between the rival parties is not caused by any very marked contrast in their views as to home and domestic policy, but mainly by the wide difference of opinion as to the foreign policy of this great commercial and manufacturing country. The *Mining Journal* does not indulge in much discussion in the field of pure politics, but some notice as to the men engaged in the conflict, who have contributed much to the success of mining and manufacturing industry in the district, may not be out of place. Mr. Burt, the member for Morpeth, has certainly proved himself to be a good and useful member, and his knowledge of mining and miners cannot fail to be useful in the next House of Commons, as it has been in the past. Mr. Stephenson, the member for South Shields, is an able man, and he is connected with large chemical and other works on the Tyne; he is also a Tyne commissioner of long standing. Sir George Elliot is the son of a pitman, and was a pitman himself; he has won a world-wide reputation as a colliery viewer and engineer and colliery owner, and is connected with a great variety of concerns in all parts of the world. He has had 12 years' experience as a legislator, and has taken an active part in the passing of the Coal Mines Act, and many other useful measures. Mr. C. M. Palmer is also a very eminent man; he is connected with the management of a large number of coal and iron mines, &c., and was the founder of the great iron and shipbuilding works at Jarrow. He also has had some years experience in the House of Commons. Mr. Joicey is the owner of extensive collieries in Durham. Mr. I. L. Bell is a man of great abilities, and is largely connected with many collieries, ironworks, and chemical works in the district.

#### REPORT FROM FOREST OF DEAN.

April 1.—There has been little change in trade since our last report, except that a lull has occurred at the forges, owing to being close upon Quarter-day, there being some uncertainty as to what change might result from the meeting of masters and others in the iron trade. The district is at present under the exciting influence of the general election. An incident occurred last week at a political meeting, at which Sir M. H. Beach and Mr. Plunkett were two of the speakers. Mr. Plunkett in the course of his speech, in order to show that the depression of trade was not imputable to the circumstance that a Conservative Government was in office, referred to the revival in the iron trade, and crediting the Forest with a marked and obvious share in that revival, was greeted with ironical laughter, and cries of "Where is it?" That there has been and still is some improvement in the iron trade in the Forest cannot be successfully denied; but no such revival or improvement has arisen here that will correspond with improvements reported in the public papers as having occurred elsewhere. The improvement here has not been great, if we judge by the increase of pig manufactures, as only one additional furnace has been blown in, and wages, which usually rise in connection with brisk trade, are still low in the Forest. And a good deal of iron ore produced from the mines in the Forest is sent to other districts, being sold to smelters elsewhere. In fact, the state of the iron trade in the Forest we consider to be a reproach to local manufacturers. The Northern masters manufacture pig and pay a heavy freightage, and deliver it in the Forest at the mills for less than the local masters will supply it at. Or supposing that the purchaser pays freightage it has to be added to the price of the iron, and amounts in some cases to 10s. a ton extra.

We fear that local manufacturers are content to move in the old ruts, whilst others are seeking improved and less expensive methods of production. At all events Forest manufacturers, with from 7s. 6d. to 10s. per ton in their favour (cost of carriage to the district from the North) ought to be able to compete in the local market so as to secure the local trade for themselves; and, further, we consider local proprietors who have no furnaces or other manufacturing works, wanting to themselves in not seeking to combine some manufacturing business with the production of coal, so as not to be so entirely dependent upon householders for black diamonds as at present is the case. Under the suggested circumstances they would be able to calculate upon profits from both sources—from the coal and the manufactured articles; or what would amount very much to the same thing, supplying themselves with coal for manufacturing purposes at cost price, they would be in a position to realise larger profits on manufactures than those who have to buy coal from pits, or off dealers. The policy of raising the price of Forest coal 3s. 6d. a ton above the price of



Welsh coal drove the trade very much from the district, as merchants went and contracted for coal in Wales for three months. Whether by adopting reduced prices and more conciliatory methods the merchants can be won back remains to be seen. At any rate the Forest masters ought to bear in mind that the price of iron affects the Forest only in an indirect manner—i.e., by affecting the price of coal, by raising it in other districts so as to induce buyers to seek a cheaper market, but as the difference of extra cost of carriage will always be taken into account, the iron trade is not likely to any great extent to affect the demand for coals in this district. We wish local coalmasters would bear this in mind, but which hitherto has not been the case, as the following incident will show:—Two managers not long since met one morning, when one accosted the other—"Iron has again gone up so much a ton; let us put on another 1s. a ton upon the coal." Happily the advice was not acted upon, as an intervening party urged the impolicy of doing so upon the individual addressed.

The policy we have just reviewed is the masters' policy, although in its effects it is felt by the workmen. Another matter complained of by the working colliers is the practice of proprietors keeping on large numbers of employees, and only finding them half, a third, or possibly in some cases a fourth of employment. In other words, the men are put on part time to the extent indicated, or for want of carts are only able to make the time indicated above. The object, doubtless, on the part of employers is to have a good staff of men ready in case of an influx of orders or revival of trade. If the wages were good when employed the men would more contentedly fall in with the plan, but with low wages, frequent stoppages, or short time employment, means half or three parts starvation to the workmen. Some think that workmen should have no voice about such matters; but seeing that themselves and families are affected for weal or woe by whatever is done by the proprietors in the way of business, it cannot be but that men will think and speak upon what so much concerns them. In consequence of the bad times numbers are leaving the district, principally by going to America. The conflict between capital and labour is beset with difficulties, and mutual consideration and kindly feeling are extremely desirable elements to be practised on both sides; and we would fain hope that when the political atmosphere becomes cleared, and a change of Government brought about, a more steady and better state of trade will take place. At present things are in a very unsatisfactory condition. Prices, we believe, remain in *statu quo*.

#### REPORT FROM DERBYSHIRE AND YORKSHIRE.

April 1.—The week has been a most interesting one, the great event being the elections, in which both masters and men appear to be deeply interested. At the ironworks in the neighbourhood of Chesterfield, as well as those in the Erewash Valley, business has gone along steadily, the production of pig being kept up to its full average. The mills have been running well, so that there has been a fair amount of business done in merchant iron, a good deal being sent to Manchester. Makers of locomotives are busier than they have been for some time, whilst there has been a better inquiry for steel tools. In Sheffield there has been very little change of late, the trade generally having become more settled. The workmen as a rule have been working well, more especially those engaged at the mills. Steel rails continue in fair request, but prices have a downward tendency, and there is now but little prospect that 10s. 10s. per ton will ever again be realised. In crucible steel a steady business is being done, and this important branch of trade is likely to be far more active than it has been for a long time past. The cutlery houses are favourably off, some few orders having been received from America as well as from the colonies, whilst the home demand appears to be rather better. In South Yorkshire the Coal Trade is quiet, and owners still complain that they are losing money by keeping the works going. Coal is now lower in price than it has been for a very long time past, and in London consumers are now able to purchase at a price lower than they could do at any period since the end of 1870.

CHARLES CAMELL AND Co. (Limited).—The sixteenth meeting of shareholders was held at Sheffield on Wednesday, when the report, recommending the payment of a dividend at the rate of 5 per cent. for the year, was adopted, and 22,795*l.* was carried forward. Mr. George Wilson, chairman of the board of directors, who presided, gave explanations as to the past year's working, referring especially to the advantages the Bessemer steel department of the company had derived from the revival of trade in the autumn of last year, and to the advantages given to it by the successful result of experiments on compound (steel-faced) armour-plates. Mr. Henry Edward Watson and Mr. John Whitehead, of Manchester, were added to the board of directors.

#### SHORT NOTICES ON IRISH MINES.

BY WILLIAM THOMAS.

If the following notices, from long personal experience and careful examination of the mines and mineral districts of the south-west of Ireland during a period of 40 years, should attract the attention of English capitalists and lead to the thorough working of our mines, I am confident that handsome returns and profits would be realised from the investment of capital, and the legitimate employment of the labouring population would be a greater boon than all the mad schemes of would-be patriots. I shall endeavour, as briefly as possible, to lay before the readers of the *Mining Journal* plain matters of fact, after which I would ask some of them to come and see and judge for themselves. From the Browhead to Roaring Water the distance is about 20 miles, and the great copper zone, or belt of true east and west lodes, occur throughout this district, and are easily traceable. The strata consist of clay-slate, elvan courses, greenstone formations, and quartz rocks, intersected by cross-courses, flookans, and canter lodes; these, with the formations just described, I find to be the most metalliferous rocks in this country. The situation of this mining district is all that could be desired for shipping produce or landing supplies; the coast is deeply indented with numerous safe bays and beautiful harbours, so that very little land carriage is required. The western end of Crookhaven harbour is close to Browhead sett. Then there is Long Island Sound and the land-locked Schull harbour, in which vessels can approach close to the dressing-floors in Coosheen Mine; further east we have Rossbrin harbour, near Ballycummisk Mine, and Audley Cove, close to Cappagh Mine; Roaring Water bay runs up to Roaring Water Mine, and a branch of it runs up to Ballydeob. In Horse Island Sound vessels can load close to the mine in that island. There are excellent roads skirting the coast running through this mining district from Skibbereen to Crookhaven, while from Browhead, Crookhaven, Schull, and Ballydeob telegraph wires are connected with all parts of the United Kingdom. The following are the names of the mines in this great mineral district:—Browhead, Crookhaven, Spanish Cove and Collars, formerly known as Irish Consols; Lymcon, Coosheen, Ardennant, Dereenatra, Kilbrongue, Ballycummisk, Cappagh, Kilcoe, and Roaring Water. In my proposed following notices I intend to describe the above mines, &c.

AUTOMATIC BRAKE.—The brake wheel is, according to the invention of Mr. C. T. POWELL, of Birmingham, secured in the ordinary manner and position, the section of the iron or steel band being determined by the requirements of each particular case of application with or without wood blocks or other material for regulating the amount of friction. To the one end of this band he attaches by necessary means a roller of such diameter as may be necessary with respect to the other parts of the construction which is acted upon by the part of the brake wheel not covered by the band, also capable of rolling upon a lever whose business it is to keep the said roller constantly pressed against the wheel to ensure its rolling action, either whilst raising or lowering the load. The other end of the band is secured either to the framework of the construction or to the lever itself. Upon this lever there may or may not, as the case may require, be attached another roller upon which the roller which is attached to the band may revolve freely when the load is being raised. In applying the invention to pulley blocks and machinery requiring

similar treatment the brake is made to act upon the rope or chain itself or upon a brake wheel attached, and either to be secured to the frame or to the lever, as before described. The one end of this lever which is operated upon to reduce the friction that is free the roller shall be made of such a form with or without a roller attached so that the said reduction of friction may be accomplished either by a separate cord attached thereto or the hoisting rope or chain itself. The invention may be applied to rolling stock when a retrograde motion is to be checked or avoided and to other useful purposes where a reverse motion is required to be checked.

#### Meetings of Public Companies.

##### GREEN HURTH LEAD MINING COMPANY.

The annual meeting of shareholders was held at Newcastle-upon-Tyne, on March 23.—Mr. J. C. SWAN in the chair. The report, which was of a highly satisfactory nature, was submitted.

The directors are gratified to report the continued success and increasing prosperity. The winning of the rich north and south vein in the lower limestone, as reported at the annual meeting last year, has proved quite as valuable as was then anticipated. The agent's report states that 400 tons of ore were raised last year from the workings in this portion of the mine. It should be observed that the working on the vein in the 30 has up to the end of last year been carried on with the principal object of opening out the mine, and not with the view of getting the great quantity of ore in a given time. The result has been that at the present moment a great extent of ground proved to be rich is available for working, and that there are now large reserves of ore which can be worked with great advantage, more especially after the completion of the new pumping and drawing shaft. The financial position warrants the declaration of a dividend of 5s. per share.

The CHAIRMAN said he need not make any lengthy observations, and the most part of the business before them was merely formal. It was not often that one had the opportunity of so highly congratulating shareholders in a mining adventure, but he could congratulate them now with good reason. There was no doubt whatever that they had had a most successful year, and up to the present time the position of the mine was a great deal better than it ever had been on any previous occasion. They would all know quite well what the history of the mine had been, and with regard to what had been done in the past he asked the secretary (Mr. C. W. Harrison) to make a summary of what had been done since 1872. He found on a capital of 1920*l.* there had been paid in dividends 14,400*l.*, at a rate equal to cent. per cent. per annum on paid up capital. It would thus be seen that all good done was not simply in last year. They had besides expended a very large sum, equal to between 4000*l.* and 5000*l.*, in the erection of buildings, machinery, and making roads, which were indispensable to the carrying on of the business. At the time of their last meeting they had just succeeded in driving a level on a layer of limestone, and from which they had great expectations. Since then their expectations had been fully realised, as it had turned out to be of very great advantage to them. They had driven about 100 fathoms of ground, the vein continuing rich all the way, and they were now assured that the mine was of great value for a long time to come. More than that, the ore not yet seen is considered to be even better than what they had already come across. The capital value of the mine in the market in January, 1879, was 6400*l.*, but in March of that year, at the time of their last annual meeting, it was worth 25,000*l.*, and at the present time it was worth 51,200*l.* That was a large increase in value as any property he knew of during the last 12 months. The position of the company, it would be seen, was in a most satisfactory condition, and it was with pleasure that he had to announce the directors were warranted in paying a dividend at the rate of 5s. per share. He moved the adoption of the report.

Major MONKS seconded the motion, which was unanimously carried. The retiring directors, Messrs. J. C. Swan, T. Sheldon, and W. Clayton were re-elected. The auditors, Messrs. Holmes, Spence, and Co., were also re-elected. A vote of thanks to the Chairman brought the proceedings to a close.

An extraordinary general meeting was held at the close of the annual one, when resolutions were passed for the reconstruction of the company, with Articles of Association in which power will be given to the directors to sell a portion of the royalty to a new company.

##### GAWTON COPPER MINING COMPANY.

A special meeting of shareholders was held at the offices of the company, Austinfriars, on March 25.

Mr. GEORGE BATTERS in the chair.

Mr. JAMES HICKEY (the secretary) read the notice convening the meeting. The resolutions submitted were the following:—

"That these mines be reconstituted under the Limited Liability Acts, and that the committee be and are hereby authorised to take such measures as may be necessary to carry the same into effect." That for the purposes of such reconstitution and registration the capital of the company shall be deemed to be fixed at 24,000*l.*, divided into 12,000 shares of 2*l.* each, with 1*l.* 10s. per share as paid up upon each share.

Upon which resolutions being confirmed, special resolutions to the following purport will be submitted to the meeting:—That for the purpose of carrying the proposed reconstitution into effect—

1.—That the present rules and regulations of the company be rescinded.

2.—That the provisions, rules, and regulations contained in the draft memorandum and Articles of Association submitted to the meeting be approved and adopted as the future rules and regulations of the company.

3.—That the company be registered under the name of the Gawton Mining Company (Limited), with a nominal capital of 24,000*l.*, divided into 12,000 shares of 2*l.* each, credited with 1*l.* 10s. per share as paid up upon each share, as previously resolved, and that upon the incorporation and registration of the limited company, and registration of a written contract fixing the amount to be credited as paid up upon each share, three shares in the capital of the limited company of 2*l.* each, 1*l.* 10s. paid, be allotted to each shareholder in respect of each share held by him in the present company, and that the present shareholders shall accept such shares as 1*l.* 10s. paid, and with a liability of 10s. per share only in respect thereof.

4.—That the present committee of the old company be the directors of the new limited company, with power to add to their number.

The CHAIRMAN: I regret to say that our Chairman, Mr. Hunter, has been called away into Ireland, and in his place I have been requested to preside. The notice which you have had sent round to you I think need hardly be read, because the matter is perfectly understood by you all. It is, in a word, the registering of your company under the Limited Liability Act. All the facts and circumstances are known to you. There is nothing taken away from any of you, and there is nothing added to your interests. The only benefit that is conferred upon you is that instead of having an unlimited liability that liability is limited to 2*l.* per share, and your shares are credited with 30s. each, which is about the amount which you have expended, and which you have paid in calls in years gone by and up to the present time. The liability left of 10s. per share is that which will provide a working capital of about 6000*l.*, and which sum, as you have heard declared by your purser, Mr. Bowden, is ample to carry out your arsenical reduction works, open up your mines, and put you into a profitable state. No doubt you have been working for that condition for a number of years, but you have never arrived at the happy goal, but now you are told that you have only to do a certain thing, and that the happy end will be realised. The price of arsenic is very good, and you have an extremely rich mine in arsenical ores, and there appears to be very little doubt but that the statement of Mr. Bowden will be borne out by the facts. Time will very soon prove it, for he tells us that in about three or four months he can have his furnaces at work, and in about one month he can see his way pretty clearly to recoup you for all the outlay on these furnaces and kilns. The carrying out of the works is a commercial necessity. You can hardly put the case in language strong enough. You can hardly imagine anybody possessed of such a mine and in such a position not carrying out this recommendation. It would be difficult to see what reason Mr. Bowden could have for making such a statement unless he saw his way to carrying it out, for he can see three or four months will prove whether it be correct or not. Of its correctness I have no doubt. Mr. Bowden has had a very large experience at Devon Consols in similar works, and with the assistance of Capt. Rowe and the very economical and practical staff you have there seems to me a future before you such as you have never had yet. You may ask, What is the state of the mine? Well, Capt. Rowe says it is gradually improving both for copper and arsenical mudic, and that in the upper levels he can produce very large quantities, and at a very early period. In fact, as your works are extended he is of opinion that he will be able to produce increased quantities, to be utilised in these works—in other words, that with the exception of Devon Consols there is probably hardly a mine in the district that is in such a position to make large returns of arsenic as the Gawton Mine.

After a conversation between several of the gentlemen present, who not understanding the scheme had it explained to them with the greatest clearness by Mr. Batters, Mr. McCULLUM said that his mine had been at work for many years, and the calls had pressed upon the shareholders so heavily that those shares had never been at a premium. In consequence of this discovery of arsenic, and that there were large quantities of it (at the last meeting Capt. Rowe stated

he had 800 tons), it was recommended that works should be put up, and these would cost from 700*l.* to 800*l.* He cordially supported the resolutions. The resolutions were all carried unanimously, and the proceedings closed with a vote of thanks to Mr. Batters for presiding.

##### LADY ASHBURTON SILVER MINING COMPANY.

The statutory meeting of shareholders was held at the company's offices, Bush-lane, March 25.—Mr. A. STRONGE GILBERT in the chair. The SECRETARY having read the notice convening the meeting, the submitted report of Capt. James Willcocks was submitted:—

March 24.—Since the commencement of operations at the above mine I have had a shaft sunk in the Wheal Langford silver lode, which is fully 3 ft. wide, composed of gossan, quartz, flookan, and silver ore, being in the clay-slate formation of the best description for the production of rich courses of silver; in fact, the stratum is of the same character as in the old Wheal Langford, which immediately adjoins us on the south-east, and when worked some 40 to 50 years since yielded a very large and remunerative profit.—No. 1, North Silver Lode: This is the Old Wheal Brothers lode, so famous when worked 50 years ago for its very rich courses of native, ruby, and chloride of silver. The late proprietors sunk a shaft 4 fms. deep within a few fathoms of your western boundary, and the north and south cross-course, which underlies east about 2 ft. in a fathom. As you are aware, the shaft referred to, and the silver ore, which was sold at the rate of 13*l.* 10s. per ton without dressing or preparation.

I can, therefore, report upon practical data as to the value of this lode and its future profitable productiveness when more fully developed. I have consulted with your engineer in regard to the mode of the immediate and future working, and we have decided that the shaft we have sunk in the same lode, about 25 to 30 fms. to the east, shall be the engine-shaft, which I am having collared up with timber 10 ft. long by 5 ft. wide as rapidly as possible, and when completed to the bottom thereof, about 4 fms. from surface, sinking with a full force of miners will be resumed to reach a 12 fm. or 15 fm. level, the greater part of which will be without the aid of steam machinery in a good lode of silver and copper ore, and whilst carrying out this work I shall have the steam-engine erected, which will give us power to sink the mine 50 fms. from surface, enabling the drainage of levels at every 12 fms. in depth through the course of silver and copper ore towards the north and south lode, a cross-course where I consider we shall find the lodes very rich for silver, and in my opinion we shall be able to go to market with profitable sales of silver and copper long before your next general shareholders meeting.

About 10 fms. south of the No. 1, or Wheal Brothers lode, a shaft has been sunk in the Silver Valley lode to a depth of 7 fms. from surface, varying in size from 3 to 4 ft. wide, composed of rich silver-lead ore, blue flookan, gossan, quartz, &c., a highly promising lode for profitable production as greater depth is attained. This lode will be drained and developed by cross-cut levels driven south from the engine-shaft on Wheal Brothers' silver lode as they go down from level to level. About 20 fms. to the north of the north silver lode, and close to your northern boundary, a shaft has been sunk in the Good Luck tin lode, which is underlying south about 2 ft. in a fathom; it is fully 6 ft. wide, composed of tin, copper, quartz, gossan with peach, containing a fair quantity of tin ore; in fact, it is the finest looking tin lode that I have seen so near the surface. This lode can also be developed by cross-cut levels driven north from the engine-shaft, and at a reasonable depth from the surface outcrop. I have no doubt a rich and profitable lode for tin will be laid open. There are other lodes in the grant that will be commanded from the engine-shaft with equally good results I hope. In closing my report to you, I beg to say that the greatest economy and expedition possible will be carried out by me to give you early sales of mineral, and as I have already stated, the value of the property will no doubt prove great prize within a few months of this date.

The CHAIRMAN said that as this was merely the statutory meeting he had really nothing to add to the report of Capt. Willcocks, which they had just heard read. They would observe that operations were being pushed on vigorously at the mine under Capt. Willcocks' direction, and that he confidently anticipated satisfactory results.—The usual complimentary vote of thanks terminated the proceedings.

##### RIO GRANDE DO SUL (BRAZIL) GOLD MINING COMPANY.

The statutory meeting of shareholders was held at the offices of the company, Finsbury-circus, on Wednesday.

Mr. BURBOUGHS D. KERSHAW, C.E., presiding.

Mr. J. A. MORGAN (secretary and solicitor) read the notice calling the meeting.

The CHAIRMAN said: Gentlemen, in calling you here to-day we have not very much to report, but by our Articles of Association and by the Joint-Stock Companies Act we are obliged to hold our statutory meeting within four months from registration. Therefore we have called you here for that especial purpose, because this period has now arrived. We should have liked to have given you some further report from the mine, but we are going on in a very satisfactory way. As to the capital, we have allotted 5081 A preference shares, which gives us a working capital of 25,405*l.*, which will be sufficient to develop the mine, and see what we really have got. We consider that amount will be ample. When we have done that we hope to be in a position, through the development of the mine, to send over sufficient to pay good dividends, and then we shall have no difficulty in further increasing the capital of the company. The progress we have made up to the present is this—we have purchased in England the requisite plant, tools, and various materials just to make a start, to the amount of 1800*l.*, of Messrs. Harvey, of Cornwall. Mr. Bankart has engaged the services of six experienced mechanics, whom he will take out with his second in command—Capt. Pooley—and he will accompany them to the Brazils, and there make use of the plant which is at present lying on the company's property, and with the various appliances he has taken over he will be able to set the men at work at certain points. We have a very large property, extending over several square miles, but we at present only propose to work the Aurora Mine, which contains some of the finest specimens of gold ore I have ever seen. It is situated within four miles of the town of Lavras, which is 150 miles from the seaport of Pelotas. There is a splendid lode at Aurora, and Mr. Bankart advises that we should first work that thoroughly, and he will take out the richest specimens, which will be sent over to England for further treatment. The poorer material we propose to crush there, and reduce it in the regular way, and then we shall have a fair return for the money expended. When he has started the Aurora Mine he will next proceed to the Serrito Mine, which is about two miles from the latter, which has a very large lode. That lode is 6 ft. wide, but is not quite so rich, but it will return a very good profit by crushing at the mine. Everything is properly organised, and Mr. Bankart will go out with full powers to act in every way with the Brazilian authorities, and also see that there is no doubt about our title to the mine and our rights to the various concessions which we have over the distant parts of the country.

Mr. GRIFFIN said he thought the power of attorney should not be placed solely in the hands of Mr. Bankart, but suggested that Mr. John Charles Bachman should represent the company in Rio de Janeiro.—Mr. J. BERTHOLD said this was a matter which had received, and would receive, the consideration of the directors, and the shareholders might safely leave it in their hands. Another agent would be appointed, and in all probability it might be the gentleman whom Mr. Griffin had named.

Mr. WALTER MYERS said the Chairman had remarked that the ores would be "reduced in the usual way." Now, he was connected with a company which in the last four years had returned 10,000*l.* a year profit from not treating the ores in that way, which they had formerly adopted. Therefore he hoped Mr. Bankart would avail himself of the most recent processes.—Mr. BARKART said he was very glad to hear there had been improvements, for improvements in gold reduction seemed to be about the slowest work there was in the United Kingdom. Nearly all the improvements had been made in America. The St. John del Rey had made an arrangement with an individual in London for the use in the mine of a new system of treating their pyrites, and one or two other parties had done the same. In the treatment of free gold there could not be very much loss. In the treatment of pyrites the great thing was to treat it to the best nicety at the least expense.

The CHAIRMAN said that Mr. Bankart had been in London for some time, and was looking up every question concerning the reduction of various kinds of ore. In the St. John del Rey the average yield was about 3/4 of gold per ton, and that company paid from 20 to 30 per cent.; but in working out the auriferous lodes of the Rio Grande do Sul the average yield would be about 2 to 3 oz. per ton. Therefore, the directors expected very much to exceed the St. John del Rey's rate of dividend. The ores in this mine had not been treated worse than in the St. John del Rey, as Mr. Bankart had had a large experience in the treatment of gold ores. He might mention to the shareholders that the ordinary half-yearly meetings of the company would be held on June 2 and December 1 in each year, and at the next meeting, in June, it would be necessary to appoint an auditor of the company.

Mr. BARKART said he had just been down to Hayle, where they had built the first revolving stamps which had been built in England. Since then great improvements had been introduced, and Mr. Husband, one of the partners, had invented the pneumatic stamps, and they were now making a stamp battery which could be worked by mules, which was an important point where mules were cheap. They would work up to 150 revolutions per minute, and could put water and steam power altogether on one side.

A vote of thanks to the Chairman closed the proceedings.

[For remainder of Meetings, see to-day's Journal.]

STEAM ENGINES.—An important improvement in the well-known Corliss engine has been invented by Mr. A. MESTERN, of Spottau, Germany, the essence of which consists in the symmetrical placing of the governor and the mechanism for transmitting the action of the lift gear of the governor to the throw out levers of the inlet valve. The governor is placed symmetrically between the valves and acts upon two light adjustable rods by which its action is transmitted to the throw out levers of the inlet valves, and by this arrangement the double angular levers of the gear usually employed are dispensed with. A very slight motion of the throw out lever is sufficient to interrupt the connection between the levers of the inlet valve and the light rods referred to, and immediately this connection is interrupted the air buffer of the valve gear comes into action and at once closes the inlet valve belonging to it. The connection of the air buffer and of the mechanical parts of the inlet valve consists of a straight rod required solely for drawing, and saves a greater number of draw rods and levers. The throwing out is done so suddenly and with so little loss of time that the number of revolutions of the



shaft and the speed of the piston may be increased beyond that of engines of the ordinary construction, without interfering in any way with the working of the valve motion and of the variable expansion gear. By placing the governor between the valves as described it is more easy of access than when in the ordinary position. The governor is driven from the main shaft by bolts and pulleys and bevel wheels. These wheels are placed in closed cast-iron cases, one of which also serves for receiving the pivot of the eccentric disc.

#### THE MINERAL RESOURCES OF COLORADO.

##### THE EAGLE RIVER MINES.

The following interesting letter has been forwarded to us from Messrs. Malins and Read, mining engineers of Red Cliff, Eagle River, Summit County, in answer to enquiries made to them about the mines in that district.

**RED CLIFF, Feb. 10.**—In reply to your questions we would say the first rush to Red Cliff took place in July, 1879, in consequence of a rich strike of carbonates in the Little Ollie claim, Battle Mountain, and for a distance of six miles almost the whole of that mountain was quickly covered with claims. Red Cliff is prettily situated at the junction of Eagle river and Turkey creek, and at present contains 50 cabins and 180 men, exclusive of the surrounding camps, Bell's camp, Helmer's camp, Rock creek and Gore creek, but it is being very rapidly built up, and the number of inhabitants is increasing every day.

2.—On Battle Mountain, where the most work at present has been done, there are three contacts, locally known as the Upper, Middle or Belden, and Lower, or quartzite contacts. The upper contact consists chiefly of magnesian limestone above wall (oxide of manganese). Through the limestone run streaks of crystallised carbonate of lime, carrying galena and silver: in two cases on following the contact in 20 ft., grey carbonates have been struck. The Middle or Belden contact has so far proved the best, and on it most of the work has been done. It is a contact between hard porphyry and limestone, and in running in between the two. We believe we are correct in saying carbonates have in every case been struck for a distance of nearly five miles. Particulars of strikes will be given later on. The Lower, or quartzite, contact has not been very much worked, still we know of at least two paying mines on this contact. Drifts have been run in on the Red Cliff side as far as 25 feet through a broken up quartzite and porphyry mass, striking a seam of pretty looking oxide of iron, which appears likely to contain native silver. Round the point on the Rock creek side the oxide of iron has in several cases run into galena at a distance of from 15 to 30 ft. from the mouth of the tunnel. The ores are most easily treated, with the exception of galena, which presents sometimes a little difficulty.

3.—Beginning on the south or Leadville side of Red Cliff the Pioneer Mine looks well. Assays have run as high as 526 ozs. silver: drift 125 ft., but mineral not yet found in place: \$4000 was refused for this mine in January. Passing by twenty or more claims, some of which are looking first rate, we come to the Horn Silver Mine, above Red Cliff. From this mine \$1700 worth of ore was shipped to Leadville in September last; ore assay ran over \$3000, chloride of silver. No mineral yet in place, but it is being vigorously worked. Both the above claims are situated on Horn Silver Mountain.

Passing to Battle Mountain on the upper contact above Red Cliff is the Mountain Chief. One-fourth of this and one-third of the adjoining claims were sold in January for \$1509. A new galena, which has not yet been assayed, was struck Feb. 8. The Mary lode, 25 ft. in, contains a streak of galena assaying 102 ozs. silver. Several other mines in the neighbourhood carry a little galena; no drift on this contact is at present in more than 40 ft. At Rock Creek, on the same contact, 5 ft. of gray carbonates have been struck in the Chloride lode.

The first claim on the middle contact, which at present carries mineral, starting from Red Cliff and running west, is the Silver King, assaying 27 ozs. silver per ton, 20 ft. in. Little Hope, next claim, is sacking ore. They have had several high assays, but we have been unable to ascertain the amount: \$3000 was refused for a one-third interest in January, before the strike, 50 ft. in.

The Black Betsey (Bell's camp, Battle Mountain) shows 27 ft. manganese and iron interspersed with galena. The Topsey, next claim, shows 24 ft. in 3 in. of galena. Highest assay, 197½ ozs. silver and a trace of gold. A one-third interest in this claim sold in January for \$2500. Shaft 70 ft. Twelve claims on one side or the other of this are all down to mineral. We then come to the Indian Girl (60 ft. shaft), May Queen (54 ft. shaft), Mexican Maid (60 ft. shaft), and the English Girl, all valuable properties and paying mines.

Passing on to Helmer's camp we come to the Belden Mine, one of the most promising properties on Battle Mountain. On this claim a shaft was first sunk striking carbonates at 40 ft. and assaying 20 ozs. silver per ton, and 40 per cent. lead. They then ran in a drift which in the middle of last month was 110 ft. in length, striking an immense body of mineral 30 ft. in thickness. Near the end of this drift a drift was run in at right angles through mineral the whole distance. They are at present exploring above and below the last mentioned drift, but have not yet got through the mineral. This mine shows one of the largest developments of carbonates of lead that has ever been known. Latest assays, Jan. 20, 1880, show 40 ozs. silver, and 22 per cent. lead. The body of ore averages 22 ozs. silver. Judge Belden offered \$10,000 some time since for the adjoining claim, but the offer was declined. The Eagle Bird, next claim but one, has an incline 210 ft. striking a two-inch vein of sand carbonates, above 5 ft. oxide of iron, carrying galena (Jan. 22). We hear now, at the date writing, that a new strike of mineral has been made and that this mine is expected to eclipse the Belden.

The Clinton Mine near Rock Creek has an incline 65 ft. (Jan. 25), and the breasts, sides, roof, and floor are of solid mineral for a depth of 715 ft.: 200 tons sand carbonates are now on the dump, averaging 20 ozs. The best assay 165 ozs. silver; how much lead not known.

The Little Ollie was bonded six weeks ago for \$60,000. This mine we have not yet seen. We hear a new paying mine has been discovered near to this last claim, a claim up Rock Creek with a 10 ft. hole, and on which a 250 ft. shaft would have to be sunk to strike the middle contact, was sold a few days since for \$300.

The only two paying mines that we know of on the lower or quartzite contact are the Silver Age and the Combined Discovery. The former has been shipping ore to Leadville during September, October, and November, when on account of the deep snow it was found impossible to ship any more. Two-ninths of this claim was sold last December to Burdell and Netherell, of the La Platta Smelter, Leadville, for \$7000. They also bought five other claims upon which no work has been done. The Combined Discovery has two tunnels, one 13 ft. and the other 15 ft., both show small pockets of galena and black sulphide. A mill run of the ore gave 250 ozs. per ton.

There are many good fissure mines on the other side of Eagle River opposite Battle Mountain. The only one we have personally inspected is the Highland Mary, opposite Rock Creek, shaft 17 ft., 5 tons of galena already on dump, assaying 95½ ozs. silver and 60 per cent. lead per ton. Claims have been taken up as far as Eagle City 8 miles on the south, and down the Eagle River as far as Gore Creek (12 miles), but immense tracts of country still remain utterly unprospected. Our distance from Roaring Forks is 70 miles. Over Independence Pass, now impassable, Roaring Forks is 80 miles from Leadville. We have from 4 ft. to 5 ft. of snow on the level. Travel, however, still goes on through here to Roaring Forks on snow shoes, but on account of the intense cold it is very dangerous work. Prospecting cannot be carried on in earnest until the end of April, but it is usual for prospectors to prepare for work during the end of this month and March, in order to be ready to start on the first break in the weather. Expense of sinking shafts: For the first 100 ft., \$10 per foot, with timbering; after that \$14 per foot; drifting averaging \$5 a foot; wages from \$3 to \$3.50 a day—Leadville wages \$3 a day for 8 hours. Contracts for sinking in Leadville about the same, if anything rather less.

A Boston company has erected a smelter here, but on account of a dispute between the road company and the miners, and some legal difficulties, the road round Battle Mountain has not been completed. This, however, must soon be done. On account of the deep snow packing ore on jacks is impossible. J. B. Grant and Co., of Leadville, proprietors of the largest smelter in the world, have taken up a site for a smelter at Rock Creek, and we hear (though we know not with what

truth) that the machinery has been ordered. Two companies have recently obtained road charters, one for a road alongside the Eagle river, the other for a road on the side of Battle Mountain above the Eagle. Another company has obtained a charter to make a road on a point on the Eagle 7 miles below Red Cliff to the Elk Mountains, Ruby Camp and the Gunnison Country, and this is to be begun immediately. A charter has also been obtained for a road from Eagle City down the Eagle to Red Cliff, thereby opening up the Horn silver mining district. The contract for making this road has already been let, and will be vigorously pushed to its completion. Rate of treating ore probably \$30 per ton.

We expect a great rush here in the course of the next few months, nearly 100 fresh prospectors arrived here to-day, and the sleighs every night bring in 20 to 30 people, most of them of the capitalist class. Prospecting is going on vigorously all around in this immediate neighbourhood in spite of the deep snow, and fresh dumps can be seen on the mountains every day. Beds are fetching \$2 each per night, and 50c. to sleep on the floor and provide your own blankets. Town lots have trebled in value within the last month, and will go much higher still, as the main rush has hardly yet commenced. Red Cliff, on account of its central position and from being situated on the only trail to the Indian reservation, the Elk Mountain and the Gunnison country that is open all the year, must always be a prosperous town and command attention. It is 8280 ft. above sea level, or about 2000 ft. lower than Leadville. The climate is clear and most healthy; in fact, we have not a sick man in camp. The cold is intense, but by no means unbearable, and the raw damp cold of Leadville is unknown.

In accordance with your request, we have answered your letter fully, and hope the information will be satisfactory. We have personally inspected most of the mines herein mentioned, and know the information to be correct. MALINS AND READ, Mining Engineers.  
—The Denver Tribune, Feb. 14.

#### Registration of New Companies.

The following joint-stock companies have been duly registered:—

**THE ABBEY BREAD AND BISCUIT COMPANY (Limited).**—Capital 50,000l., in shares of 1l. To acquire a business at Chertsey and carry on the manufacture of bread and biscuits. The subscribers (who take one share each) are—W. W. Knollys, 102, Belgrave-road; J. R. Pearson, 8, Northumberland-alley; F. Robinson, 25, Coleman-street; W. B. Harrison, 19, Chancery-alley; E. Smith, Abchurch Chambers; S. L. Tonkins, East Grimstead; H. J. Leslie, 1, Frederick-place.

**CASH EXPENDITURE REPAYMENT TRUST (Limited).**—Capital 100,000l., in shares of 5l. To collect discounts upon sales or investments, and to invest the same. The subscribers (who take one share each) are—P. Keating, 8, Old Jewry; W. F. Hooper, Tower Chambers; R. K. Stubbs, 29, Bush-lane; W. G. Payne, 12, Buckingham-street; C. Smith, Leamington; C. Messent, 108, Fleet-street; J. J. Lucas, 33, Guildford-street; E. W. Gabriel, 12, Dowgate Hill.

**THE GENERAL HORTICULTURAL COMPANY (JOHN WILLS) (Limited).**—Capital 100,000l., in shares of 5l. To carry on an established business of florists, nurserymen, &c. The subscribers (who take one share each) are—Lord Skelmersdale, 41, Portland-place; the Earl of Rosslyn, 51, Grosvenor-street; Lord Suffield, 46, Upper Grosvenor-street; J. Pender, 18, Arlington-street; Lord Londesborough, 38, Berkeley-square; Admiral E. Inglefield, 99, Queen's Gate; C. Biscoff, 23, Westbourne-square; J. Wills, 16, Onslow-crescent.

**OLD QUAY MILL COMPANY (Limited).**—Capital 40,000l., in shares of 10l. To carry on at Runcorn or elsewhere the business of corn, rice, and seed millers. The subscribers (who take one share each) are—E. Paul, Liverpool; E. Storey, Birkenhead; S. Wyld, Runcorn; A. N. Steen, Liverpool; W. H. Phillips, Liverpool; F. M. Rigby, Liverpool; F. D. Muir, Waterloo; W. Johnston, Liverpool; H. L. Smyth, Liverpool.

**THE NOTTINGHAMSHIRE FINANCE COMPANY (Limited).**—Capital 10,000l., in shares of 10l. For the purpose of advancing money on all kinds of securities. The subscribers are—J. Mortimer, Great Russell-street, 26; W. Boyd, Nottingham, 10; F. C. Boyd, Chillwell, 8; C. Stuart, Nottingham, 2; H. Payne, 34, Glasshouse-street, 2; H. J. Wilkes, 476, Oxford-street, 2; H. Cotton, Nottingham, 2.

**THE MINERAL STEAMSHIP COMPANY (Limited).**—Capital 200,000l., in shares of 1l. The carrying on the business of carriers by sea. The subscribers (who take one share each) are—W. C. Armstrong, 5, St. Alban's-place; E. R. H. Gray, 9, Petersham-terrace; D. Macgregor, Portside; K. Liverhoff, 7, Mining-lane; C. J. Allport, 11, Queen Victoria-street; A. Matthew, 1, Threadneedle-street; J. Matthew, 1, Threadneedle-street.

**LONDON INSECTICIDE COMPANY (Limited).**—Capital 10,000l., in shares of 5l. To manufacture and sell a certain composition for the destruction of insects. The subscribers (who take one share each) are—A. Ball, 21, St. Helen's-place; C. S. Lamb, 21, St. Helen's-place; A. Robinson, 11, Queen Victoria-street; J. C. W. Stanley, 41, Barnsdale-road; F. Fletcher, 70, Lower Thames-street; J. W. Bonner, 93, Woodstock-road; H. Hollands, Croydon.

**SOUTH LONDON DAIRY SUPPLY ASSOCIATION (Limited).**—Capital 100,000l., in shares of 2l. and 5l. To carry on a dairy business in London or elsewhere. The subscribers are—W. E. Brook, Clapham, 1; H. Macdonald, Walbrook, 1; G. J. Anson, Flint, 20; J. Alexander, 30, Walbrook, 20; F. Mason, Peckham, 1; G. H. Bryant, Greenwich, 20; F. Macdonald, 104, Culford-road, 1; F. W. Smith, Patney, 2.

**THE LANKA PLANTATION COMPANY (Limited).**—Capital 150,000l., in shares of 10l. To acquire estates in Ceylon for the purpose of cultivating coffee, tea, cocoa, &c. The subscribers are—Sir H. B. Sandford, 136, Inverness-terrace, 200; G. Allen, 17, Carlisle-street, 200; R. P. Harding, 8, Old Jewry, 500; E. G. Harding, 25, Cambridge-street, 300; T. Della, 12, Kent-terrace, 25; W. Grime, 11, St. Helen's-place, 25; W. Bois, 8, Old Jewry, 5.

**SHEFFIELD BANKING COMPANY** now incorporated under the Limited Liability Act.

**BARRY'S CONDENSED SOUPS AND FOOD COMPANY (Limited).**—Capital 50,000l., in shares of 1l. To carry on the established business at Bermondsey Mills. The subscribers (who take one share each) are—W. Barry, Peckham-grove; J. J. Stansfield, 10, Bush-lane; M. J. Cooper, South Hackney; C. A. P. Talbot, 29, Leadenhall-street; A. Betts, 46, Doughty-street; B. C. Badham, 5, Great Queen-street; J. W. Watts, Brixton.

**THE QUEENSLAND PASTORAL COMPANY (Limited).**—Capital 200,000l., in shares of 10l. To carry on the business of an agricultural and pastoral company in Queensland or elsewhere. The subscribers are—W. Gardner, 12, Red Cross-street, 100; J. C. Stirling, Gracechurch Buildings, 100; J. B. Tritton, 63, St. George's-square, 50; B. K. Clarke, Reading, 100; T. L. Rothes, Reading, 100; J. Ward, Watford, 100; H. Vignolles, 15, Delahay-street, 100.

**THE WHITCHURCH AND ELLSMERE BANKING COMPANY** is now incorporated under the Limited Liability Act.

**THE CHEADLE COLLIERY COMPANY (Limited).**—Capital 100,000l., in shares of 10l. To adopt and confirm a certain contract made between R. Plant on the one part and W. Molyneux on behalf of the company, and carry out the same. Power is taken to purchase or otherwise acquire any mines or properties other than those mentioned in aforesaid contract, to work and develop them, and to win, raise, deal in, and sell the coal, ironstone, clay, and all other minerals and products of every kind which may be found. To burn, smelt, work, or manufacture the minerals, and to establish all suitable works, machinery, plant, &c. The subscribers (who take one share each) are—R. Plant, Chedale, colliery proprietor; W. Molyneux, Burton-on-Trent, geologist; J. H. Haines, Longton, mining engineer; W. G. Simpson, Chedale, cashier; W. Hanson, Chedale, brick manufacturer; J. Plant, Chedale, farmer; J. H. Keates, Sheffield, insurance superintendent. The first directors shall be Messrs. R. Plant, W. Molyneux, and J. H. Haines, the remuneration being fixed at 150l. per annum, and such percentage out of net profits as the shareholders shall determine in general meeting.

**CROWN WELLS HOUSE, HARBOROUGH (Limited).**—Capital 30,000l., in shares of 10l. To purchase the Crown Hotel at Harrogate, and to continue the business of hotel proprietor, &c. The subscribers are—W. T. Burns, Harrogate, 150; W. Hardy, Harrogate, 5; J. Shaw,

Knarborough, 50; G. Dawson, Harrogate, 50; T. Chappel, Harrogate, 5; W. Hunter, 37, Lombard-street, 5; J. Speer, 8, Bow Church-yard, 5.

**THE CYFARTHFA STEAMSHIP COMPANY (Limited).**—Capital, 20,000l., in shares of 200l. To purchase the steamship Cyfarthfa and other vessels for the purpose of carrying on the business of shipowner. The subscribers (who take one share each) are—F. J. Beavan, Cardiff; J. A. Gibbs, Cardiff; T. Morel, Cardiff; P. Morel, Cardiff; W. Baker, Cardiff; W. W. Bartlett, Cardiff; W. J. Bartlett, Penarth; P. Gibbs, Cardiff.

**PORTER'S SHIPPING COMPANY (Limited).**—Capital 50,000l., in shares of 5l. To construct, buy, work, and sell ships, vessels, &c. The subscribers (who take one share each) are—E. Porter, Fleetwood; E. O. Lord, Rochdale; J. Butterworth, Rochdale; M. Peel, Bury; W. Shepherd, Pilling; T. Davies, Fleetwood; J. R. Gibson, Fleetwood.

**THE WOLVERHAMPTON AND MIDLAND NEWSPAPER COMPANY (Limited).**—Capital 10,000l., in shares of 10l. To carry on the business of printers, publishers, stationers, &c. The subscribers (who take one share each) are—T. W. Shaw, Wolverhampton; E. D. Shaw, Wolverhampton; H. Loveridge, Wolverhampton; W. H. Jones, Wolverhampton; D. J. Harner, Wolverhampton; S. Dickinson, Wolverhampton; M. Bayliss, Wolverhampton; J. Slater, Darlaston.

#### THE COPPER TRADE.

Messrs. HENRY R. MERTON and Co. (Leadenhall-street, April 1) issue the following Statistics of Copper:—

Stocks in Europe:	
Chili ores and regulus, Liverpool and Swansea (equal to fine).....Tons	465
Chili bars in Liverpool.....	25,427
Chili bars in Swansea.....	6,972
Chili ingots in Liverpool.....	50
Chili ingots in Swansea.....	86
Foreign copper (chiefly Australian) in London.....	4,819
Foreign copper.....	50
English copper in London.....	3
Chili bars and ingots and barilla in Havre (estimated).....	3,552
Other copper in Havre.....	633
Stocks of copper contained in other foreign ore and Spanish Precipitate (fine).....	1,787
Afloat, and chartered from Chili to Europe (advised by mail):	
Ore and regulus (equal to fine).....	2,183
Bars and ingots.....	11,004
By cable, ores and regulus (fine).....	1,700
Bars and ingots.....	1,900
Afloat from Australia (advised by mail):	
Fine copper.....	1,912
By cable: Fine copper.....	1,409
Total.....	63,958

The correct Havre stocks on March 1st were 3511 tons Chili and 529 tons other sorts, making the total for that date 62,902 tons.

Messrs. HARRINGTON, HOBAN, and Co. (Liverpool) report:—Chili copper charters for the first half of this month were 1000 tons fine, consisting of 600 tons bars and 250 tons furnace material for England, and 150 tons bars for the Continent. On the issue of our last report the price of Chili bars was 69l. 10s. per ton, and after reaching 70l. it gradually declined in value until 65l. was touched. A reaction then set in, and to-day's quotations are 66l. to 67l. 10s. per ton, according to brand and position of bars. Some Spanish precipitate sold at 13s. 10d., as also some English out of second hands at 14s. 3d.: 50 tons English out of first hands sold at 14s. 4½d. per unit. About 900 tons Cape ore and a small parcel Peruvian ore sold at 13s. 9d. per unit. At the Swansea sale, by tender, on the 23rd inst., 1244 tons, average produce 9½ per cent., realised 13s. 4½d. per unit. Import of Chili copper during the past fortnight 1000 tons fine, against 1393 tons fine same time last year. Delivery of ditto, 1109 tons, against 1415 tons same time last year. Arrivals here during the fortnight of West Coast, S. A., produce: Camana, from Valparaiso, 48 tons regulus, 42 tons bars; Valparaiso, from Valparaiso, 35 tons regulus, 67 tons bars; Parkmoor, from Valparaiso 34 tons bars; Elsa, from Coquimbo, via Allos, 50 tons bars. At Swansea: Lord Marmion, from Tocopilla, 730 tons ore; Henry Bath, from Molendo, via Liverpool, 300 tons ore; Magnet, from Tongoy, 119 tons regulus, 496 tons bars, 75 tons ingots. Stocks of copper (Chilian and Bolivian) in first and second hands, likely to be available, we estimate at—

	Ores.	Regulus.	Bars.	Ingots.	Barilla.
Liverpool.....	730	710	25,427	50	—
Swansea.....	730	710	6,972	86	—
Total.....	730	710	32,399	136	—

Representing about 33,000 tons fine copper, against 33,109 tons March 15; 28,145 tons March 31, 1879; 17,935 tons March 30, 1878; 13,847 tons March 31, 1877. Stock of copper contained in other foreign ore and Spanish precipitate, 1787 tons fine. Stock of Chili copper in Havre, 3504 tons fine, against 4289 tons March 15, 1879. Stock of Coro Coro barilla in Havre 72 tons fine, against 365 tons March 15, 1879. Stock of Chili copper afloat and chartered for to date, 19,000 tons fine, against 12,000 tons March 15, 1879. Stock of foreign copper in London, chiefly Australian, 4873 tons fine, against 6808 tons March 15, 1879.

Messrs. FRENCH and SMITH (London, April 1) write:—The market was dull throughout the past month, and speculatively held parcels were continually being pressed for sale. Charters from the West Coast were advised—for first half of March, 1700 tons; for second half, 1000 tons. We quote Chili bars 66l., Wallaroo 80l., tough 74l., manufactured 79l. to 80l., ore and regulus 13s. 9d. to 14s. 6d. The imports and exports for January and February (two months) were, by Board of Trade Returns:—

	1880.	1879.	1878.
Imports.			
Ore.....Tons	17,358	13,487	13,857
Regulus.....	6,239	6,177	4,016
Copper.....	4,906	7,782	5,364
Exports.			
Foreign raw.....	2,822	2,075	2,307
English raw.....	2,357	2,380	3,847
Manufactured, including yellow metal and brass.....	4,872	3,950	4,527

#### THE TIN TRADE.

Messrs. STRAUSS and Co. (London, March 31) issue the following Statistics of tin:—

	March 31, 1880.	March 31, 1879.	March 31, 1878.
Straits and Australian, spot.....Tons	8,022	9,763	8,518
Straits, afloat.....	229	298	351
Australian afloat.....	1,458	650	635
Banca, on warrants.....	1,565	1,703	2,386
Billiton, spot.....	1,692	2,101	1,647
" afloat.....	1,010	1,050	1,100
Australian tin in Holland.....	209	297	432
Total.....	14,174	17,914	16,639
Prices of Straits.....£88 0	£88 10	£88 10	£83 0
Deliveries during month in London.....	880	1,054	1,019
" " Holland.....	401	630	458

	1880.	1879.	1878.
Shipments (March) from Straits.....Tons	1,321	1,684	1,477
" " " Australia.....	450	—	—
During 12 months ending March 31—			
Shipments from Straits to London.....Tons	1,830	3,555	2,991
Shipments from Australia to London.....	7,483	8,699	9,372
Deliveries of tin in London.....	12,511	12,280	11,563
Deliveries of tin in London and Holland.....	20,496	20,979	18,995
Banca in Trading Company's hands and afloat, 1013 tons.			

Messrs. FRENCH and SMITH write:—In spite of the small shipments from the Straits and Australia to England prices have continued to decline, the lowest point touched being 84l. for foreign. This price brought out buyers, who raised value quickly to 88l., but it again declined to 86l. On March 31 the Dutch Trading Company sold at public sale 14,988 slabs Banca at 51 fl. to 51 75 fl., average 51 25 fl., partly of about 86l. per ton there; 5311 slabs Billiton realised 50 25 fl. to 50 50 fl. We quote foreign 85l., English ingots 92l., Banca 51 fl., Billiton 50 fl. Below we give our usual statistics:—

	1880.	1879.	1878.
Foreign in London.....Tons	8,251	10,061	8,870
Banca in Holland.....	1,564	2,050	1,571
Billiton in Holland.....	1,692	2,100	1,647
Afloat for England, Straits, advised by mail and wire.....	—	715	650
Afloat Australian ditto.....	1,600	1,512	2,200
Afloat Billiton.....	1,010	1,070	1,100
Banca in Dutch Trading Co.'s hands.....	888	490	204
Banca afloat by sailing vessels.....	297	1,000	350
Total.....	15,302	19,398	16,612

EPPE'S COCOA—GRATEFUL AND COMFORTING.—"By a thorough knowledge of the natural laws which govern the operations of digestion and nutrition, and by a careful application of the fine properties of well-selected cocoa, Mr. Eppe has provided our breakfast tables with a delicately flavoured beverage which may save us many heavy doctors' bills. It is by the judicious use of such articles of diet that a constitution may be gradually built up until strong enough to resist every tendency to disease. Hundreds of subtle maladies are floating around us ready to attack wherever there is a weak point. We may escape many a fatal shaft by keeping ourselves well fortified with pure blood and a properly nourished frame."—Civil Service Gazette.—Sold only in packets labelled—"JAMES EPPE and Co., Homeopathic Chemists, London."



# HADFIELD'S STEEL FOUNDRY COMPANY



AWARDED THE ONLY GOLD MEDAL AT PARIS EXHIBITION, 1878, FOR CRUCIBLE STEEL CASTINGS. FIRST PRIZE MEDALS AT LEEDS, WREXHAM, AND MANCHESTER EXHIBITIONS, 1875 AND 1876. AND THE HIGHEST AWARD FROM THE MINING INSTITUTE OF CORNWALL, 1878.



ATTERCLIFFE, SHEFFIELD,

MANUFACTURERS EXCLUSIVELY OF

Crucible and Cast Steel Castings,  
FOR  
Engineering & Mining Purposes,

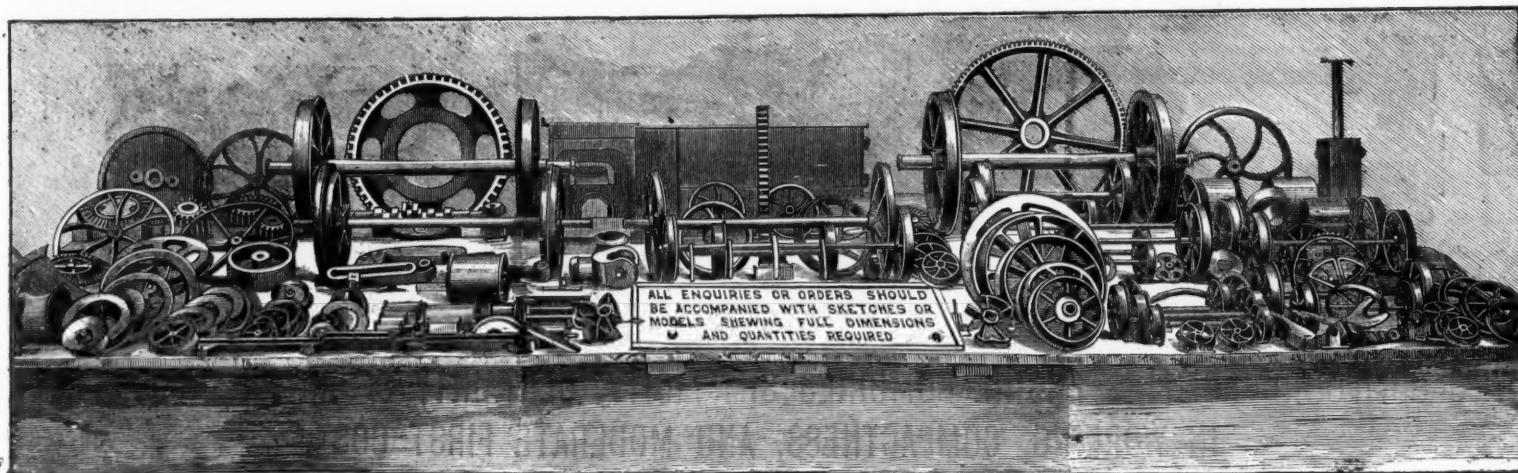
THE ONLY GOLD MEDAL.

AND ARE THE SOLE MAKERS OF

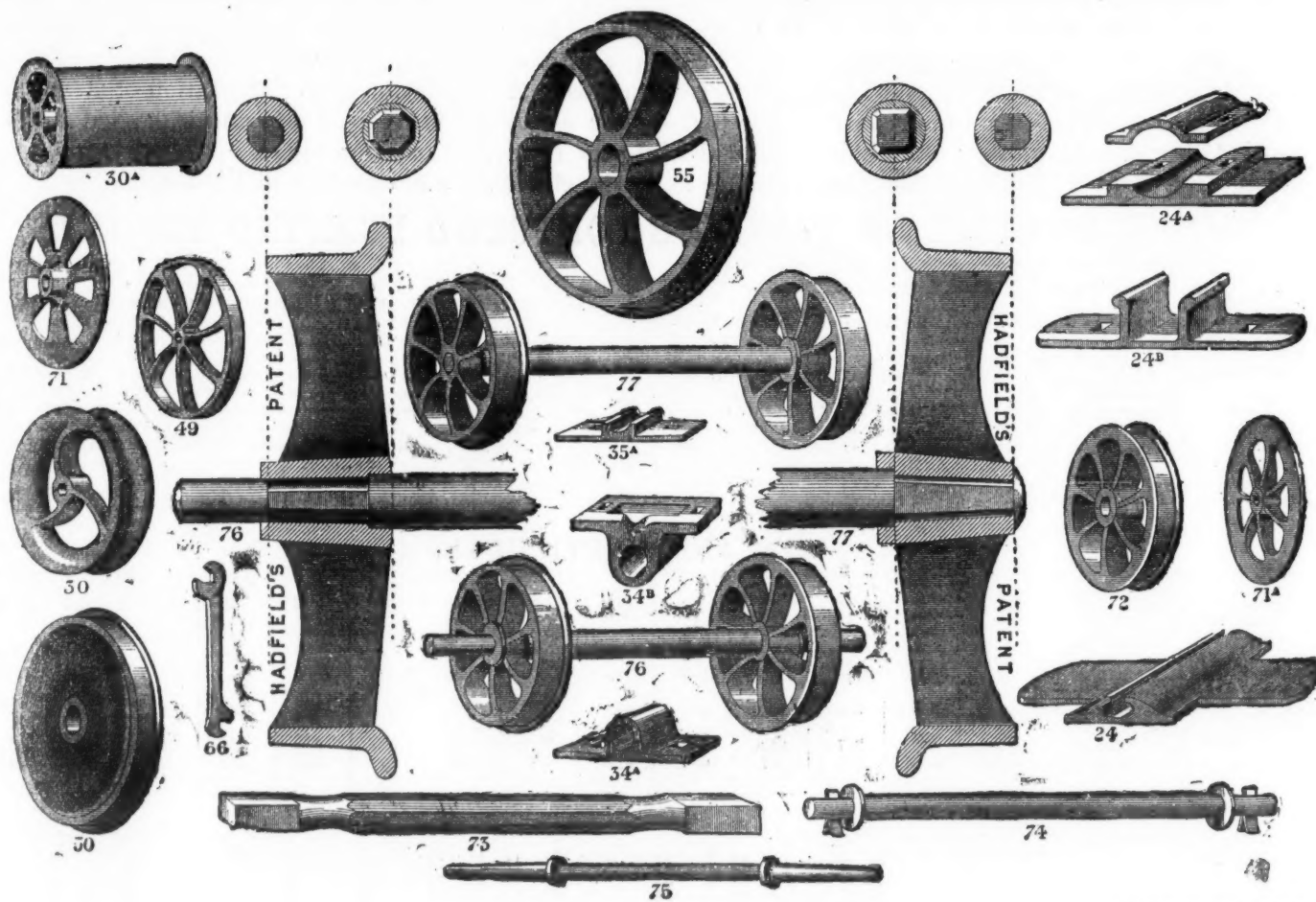
THE ONLY GOLD MEDAL.

## HADFIELD'S CAST STEEL WHEELS.

One of our departments is specially adapted for the manufacture of these Wheels (as shown below), for Collieries, Ironstone Mines, Slate Quarries, Ironworks, Lead Mines, &c., &c. We have made, and are now making, many HUNDRED THOUSANDS; and having Patented a New Method of Fitting Wheels upon axles, being cheap, effective, and expeditious, we can execute orders entrusted to us with promptitude, our capacity in this department alone being equal to about 2000 wheels per week.



N.B.—Prices per Set of Wheels and Axles, fitted complete, forwarded on receipt of diameter of wheel on tread, depth of tread, real gauge, and thickness of axles and rolling load.



[This Sheet of Drawings is Copyright.]

### HADFIELD'S PATENT METHOD OF FITTING WHEELS UPON AXLES.

The advantages of the above system are that the Wheels being forced upon a Taper Square-ended Axle, by Machinery, and then riveted (the machine securing truth), it is impossible that they can come loose or get within gauge. They are very cheaply fitted on, and run exceedingly true. We construct the Arms of wheels upon the curved principle (as shown in the drawings above), consequently the shrinkage or cooling of the Castings is not interfered with, thus securing the greatest advantages of our very strong material. CRUCIBLE CAST-STEEL WHEELS, when cast by us, are made from one-third to one-half lighter than Cast-Iron. They cannot be broken while working, even with rough usage, and will wear at least twelve times as long as Cast-Iron, thus saving animal and steam power, and reducing wear and tear immensely. We would also draw special attention to our INCLINE PULLEYS and CAGE GUIDES, the adoption of which will prove highly advantageous.

MACHINE MOULDED STEEL GEAR WHEELS OF EVERY DESCRIPTION.





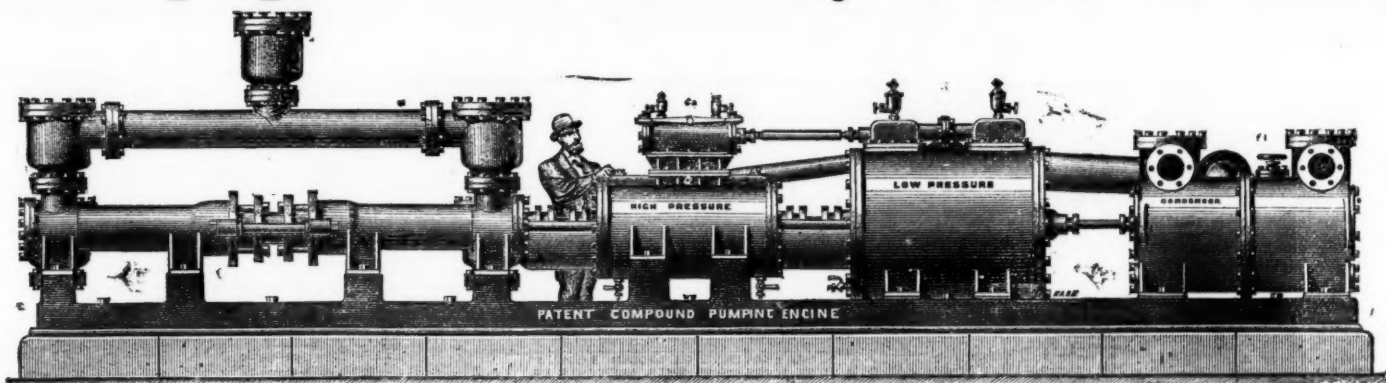
PARIS EXHIBITION, 1878.  
GOLD AND SILVER MEDALS AWARDED for  
Steam-Engines & Boilers, also the Special Steam Pump,  
and Compound Pumping Engine.

TANGYE BROTHERS AND HOLMAN,

CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,  
AND BIRMINGHAM, (TANGYE BROTHERS), CORNWALL WORKS, SOHO.

TANGYE'S DIRECT-ACTING  
COMPOUND PUMPING ENGINE,

For use in Mines, Water Works, Sewage Works,  
And all purposes where Economy of Fuel is essential.



TANGYE'S DIRECT-ACTING COMPOUND PUMPING ENGINE, WITH AIR-PUMP CONDENSER.

TANGYE'S COMPOUND PUMPING ENGINE COMBINES SIMPLICITY, CERTAINTY OF ACTION, GREAT ECONOMY  
IN WORKING, COMPACTNESS, AND MODERATE FIRST COST.

This Engine will be found the most simple and economical appliance for Mine Draining, Town Water Supply, and General Purposes of Pumping ever introduced, and as regards Mine Draining, the first cost is very moderate compared with the method of raising water from great depths by a series of 40 or 50 fm. lifts. No costly engine-houses or massive foundations, no repetition of plunger lifts, ponderous connecting rods, or complication of pitwork, are required, while they allow a clear shaft for hauling purposes. In this Engine the economical advantages resulting from the expansion and condensation of steam are very simply and effectively obtained. The steam after leaving the high-pressure cylinder is received into and expanded in the low-pressure cylinder, and is thus used twice over before being exhausted into the condenser or atmosphere.

The following first-class Testimonials will bear evidence as to the efficiency and economy of the Engine:—

TESTIMONIALS OF TANGYE'S COMPOUND PUMPING ENGINE.

21" Newcastle and Gateshead Water Company, Newcastle-on-Tyne, Oct. 20, 1879.  
36 x 10" x 48" COMPOUND CONDENSING STEAM PUMPING ENGINE.  
Messrs. Tangye Brothers.  
GENTLEMEN,—In reply to your enquiry as to the efficiency of the two pairs of Compound Condensing Engines recently erected by you for this company at our Gateshead Pumping Station, I have great pleasure in informing you that they have far surpassed my expectations, being capable of pumping 50 per cent. more water than the quantity contracted for; and by a series of experiments I find they work as economically as any other engine of the compound type, and will compare favourably with any other class of pumping engine. By the simplicity of their arrangement and superior workmanship they require very little attendance and repairs, and the pumps are quite noiseless. A short time ago I had them tried upon air by suddenly shutting off the column, and found they did not run away, thus showing the perfect controlling or governing power of the Floyd's Improved Steam-moved Reversing Valve. I will thank you to forward the other two pairs you have in hand for our Benwell Pumping Station.  
(Signed) Yours respectfully,  
JOHN R. FORSTER, Engineer.

The Chesterfield and Boythorpe Colliery Company (Limited),  
Registered Office, Boythorpe, near Chesterfield, Oct. 1, 1879.  
36 x 12" x 48" DOUBLE RAM COMPOUND CONDENSING STEAM PUMPING ENGINES.  
Messrs. Tangye Brothers.  
Supplied in January, 1878.  
GENTLEMEN,—Referring to the above, which we have now had working continuously night and day for the last 12 months, we are glad to say that it is giving us every satisfaction. It is fixed about 400 feet below the surface, the steam being taken down to it at pressure of 45 lbs. per square inch. We can work the pump without any difficulty at 28 strokes per minute—224 ft. piston speed. The pumping power is enormous. The vacuum in the condenser being from 11½ to 13 lbs. The pump is easily started, and works well and regularly. The amount of steam taken being much less than we anticipated. We consider the economy in working very satisfactory indeed. The desire for power and economy at the present day will certainly bring this pump into great requisition.  
Yours truly,  
(Signed) M. STRAW, Manager.

SIZES AND PARTICULARS.

Diameter of High-pressure Cylinder.....In.	8	8	8	10	10	10	10	12	12	12	12	14	14	14	14
Ditto of Low-pressure Cylinder .....	14	14	14	18	18	18	18	21	21	21	21	24	24	24	24
Ditto of Water Cylinder .....	4	5	6	5	6	7	8	6	7	8	10	7	8	10	12
Length of stroke .....	24	24	24	24	24	24	24	24	24	24	24	36	36	36	36
Gallons per hour approximate .....	3900	6100	8800	6100	8800	12,000	15,650	8,800	12,000	15,650	24,450	12,000	15,650	24,450	35,225
Height in feet water can be raised with 40 lbs. pressure per square inch in cylinder .....	360	330	160	360	250	184	140	360	264	202	130	360	275	175	122
Ditto ditto ditto—with Holman's Condenser...	480	307	213	480	333	245	187	480	352	269	173	480	367	234	162
Ditto ditto ditto—with Air-pump Condenser...	600	384	267	600	417	306	335	600	440	337	216	600	459	203	203

CONTINUED.

Diameter of High-pressure Cylinder .....	16	16	16	16	18	18	18	18	21	21	21	24	24	24	30	30
Ditto of Low-pressure Cylinder .....	28	28	28	28	32	32	32	32	36	36	36	42	42	42	52	52
Ditto of Water Cylinder .....	8	10	12	14	8	10	12	14	10	12	14	10	12	14	12	14
Length of stroke .....	36	36	36	36	48	48	48	48	48	48	48	48	48	48	48	48
Gallons per hour approximate .....	15,650	24,450	35,225	47,950	13,650	24,450	35,225	47,950	24,450	35,225	47,950	24,450	35,225	47,050	35,225	47,950
Height in feet water can be raised with 40 lbs. pressure per square inch in cylinder .....	360	230	160	118	456	292	202	149	397	276	202	518	360	264	562	
Ditto ditto ditto—with Holman's Condenser...	480	307	213	154	603	389	269	196	528	363	269	691	480	352	750	
Ditto ditto ditto—with Air-pump Condenser...	600	384	267	191	750	486	337	248	660	450	337	864	600	440	937	

PRICES GIVEN ON RECEIPT OF REQUIREMENTS.

Any number of these Engines can be placed side by side, to work in conjunction or separately as desired, thereby multiplying the work of one Pump to any extent.

NORTHERN DEPOT:—TANGYE BROTHERS, 51, NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.



TWO GOLD MEDALS.



SOLE MAKERS—

The **LEEDS FORGE CO., Ltd.**,  
Leeds, Yorkshire.

FOX'S PATENT

CORRUGATED FURNACE FLUES,

NOW APPLIED TO OVER

**1000** IND. **00** H.P.

PARIS, 1878.

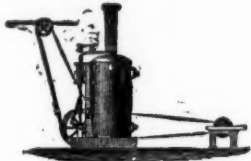


PRICE LISTS AND  
PARTICULARS  
ON APPLICATION.

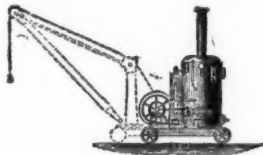
## CHAPLIN'S PATENT PORTABLE STEAM ENGINES AND BOILERS.

(PRIZE MEDAL, INTERNATIONAL EXHIBITION.)

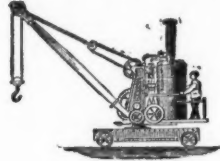
ALWAYS IN STOCK OR IN PROGRESS.



STATIONARY ENGINE.  
From 1 to 30 horse-power.  
No building required.



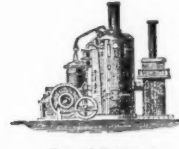
PORTABLE HOIST.  
1 to 30 horse-power.  
With or without Jib.



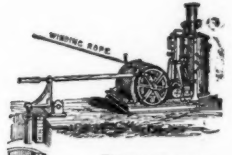
STEAM CRANE.\*  
15 cwt. to 20 tons.  
For Wharf or Rail.



CONTRACTORS' LOCOMOTIVE.  
9 to 27 horse-power.  
For Steep Inclines and Quick Curves.



SHIPS' ENGINE.  
For Winding, Cooking, and Distilling.  
Sanctioned by H.M. Government.



PUMPING AND  
WINDING ENGINE.  
5 to 30 horse-power.

\* These cranes were selected by H.M. Commissioners to receive and send away the heavy machinery in the International Exhibitions 1862, 1871, and 1872.

Chaplin's Patent Improved Steam Excavator or "Navy."  
Steam and Hand Derrick and Overhead Travelling Cranes.

Engines and Boilers for Light Screw and Paddle Steamers.  
Steam Cargo Barges, Steam Launches, and Yachts.

PATENTEES AND SOLE MANUFACTURERS:

ALEX. CHAPLIN AND CO., CRANSTONHILL ENGINE WORKS, GLASGOW.

London House: 63, Queen Victoria-street, London, E.C.

ENGINES OF EACH CLASS KEPT IN STOCK, AND ALL OUR MANUFACTURES GUARANTEED AS TO EFFICIENCY, MATERIAL, AND WORKMANSHIP.

Parties are cautioned against using or purchasing imitations or infringements of these Patent Manufactures.

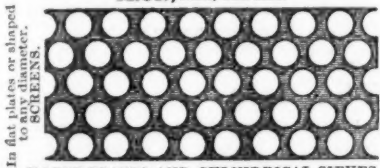
Export  
Orders  
promptly  
attended to.

PERFORATORS, WIRE WEAVERS, AND GENERAL  
IRONMONGERS,

J. AND F. POOL,

COPPERHOUSE, HAYLE, CORNWALL.

Millimeter holes perforated in sheet-copper, brass,  
IRON, steel, and zinc.



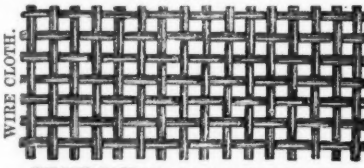
JIGGER-PLATES AND CYLINDRICAL SIEVES.

Manufacturers of Stamps-Grates, Sieves, and Riddles, for Mining and other purposes, by Self-acting  
Steam Machinery.

CERTIFICATE OF MERIT

Awarded by the  
Mining Institute of Cornwall  
for  
SIEVES AND GRATES,  
Shown at the Annual Exhibi-  
tion, 1879.

Lineal holes per inch woven in copper, brass,  
iron, and steel wire.



JIGGER-BOTTOMS AND CRUSHER SIEVES.

SPECIALITY.—Thick Copper, Brass, Zinc, and IRON Perforations, Classifying-Sieves,  
Pierced Pulveriser and Stamps-Grates up to 289 holes to the square inch, Copper-  
bottom "Tinsifts" and Hair-bottom "Delewerling-serges."

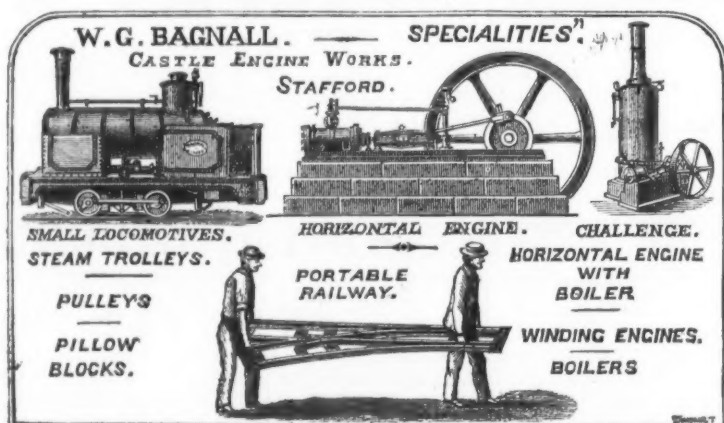
## MINING AND COLLIERY TOOLS.

Picks, Shovels, Rakes, Riddles, Skips, Blowing Tools, Pit Tubs, Crucible Cast Steel  
Wheels and Axles, Tram Nails, Bolts and Nuts, Washers, Wagon Wheels and Axles,  
Springs, Chains and Traces, Harness, Files, Lifting Jacks, Crabs, Cranes, Pulley  
Blocks, Pit and other Rails, Screen Bars, Air Pipes, Brattice Cloth, Gas Steam and  
Water Pipes, Loco Tubes, Smiths' Hearths complete, Smiths' Tools, Powder Magazines  
and Safes, Wire and Hemp Ropes, Pit Tub and Wagon Ironwork of every description.

A LARGE STOCK ALWAYS ON HAND.

F. H. WARDEN (LATE THOS. WARDEN & SON),  
BROMFORD IRON & STEEL WORKS, LIONEL ST., BIRMINGHAM.

W. G. BAGNALL, STAFFORD.



## SOLID DRAWN BRASS AND COPPER BOILER TUBES,

FOR LOCOMOTIVE OR MARINE BOILERS,  
EITHER

MUNTZ'S OR GREEN'S PROCESS.

MUNTZ'S METAL COMPANY (LIMITED),  
FRENCH WALLS,  
NEAR BIRMINGHAM.

YEADON AND CO.,  
LEEDS,

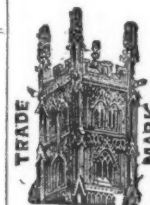
ENGINEERS, CONTRACTORS, &c.  
FOR EVERY DESCRIPTION OF PLANT FOR  
Collieries, Mines, Brickworks, &c.

FRANCIS AND JENKINS,  
GREENFIELD WORKS,  
LLANELLY, S. WALES,

MANUFACTURERS OF THE  
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ALSO MANUFACTURERS OF  
COPPER WORKS' LADLES,

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Lists and Samples on application.

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STEEL (OR IRON) TRAMS AND TIPPING TRUCKS  
Patented in Europe, America, and British South Africa  
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FOR MY LATEST PATENTED STONE BREAKERS AND ORE CRUSHERS.

**Stones broken equal, and Ores better, than by hand, at one-tenth the cost.**

HIGHEST AWARDS  
FROM THE  
MINING INSTITUTE  
OF CORNWALL.

# H. R. MARSDEN,

ORIGINAL PATENTEE AND SOLE MAKER OF BLAKE-MARSDEN

PULVERISERS,  
BONMILLS,  
MORTAR MILLS,  
&c., &c.]

## Improved Patent Stone Breakers & Ore Crushers.

**New Patent Reversible Jaws,  
in Sections, with Patent  
Faced Backs.**

**NEW PATENT ADJUSTABLE  
TOGGLES.**

**OVER 2750 IN USE.**

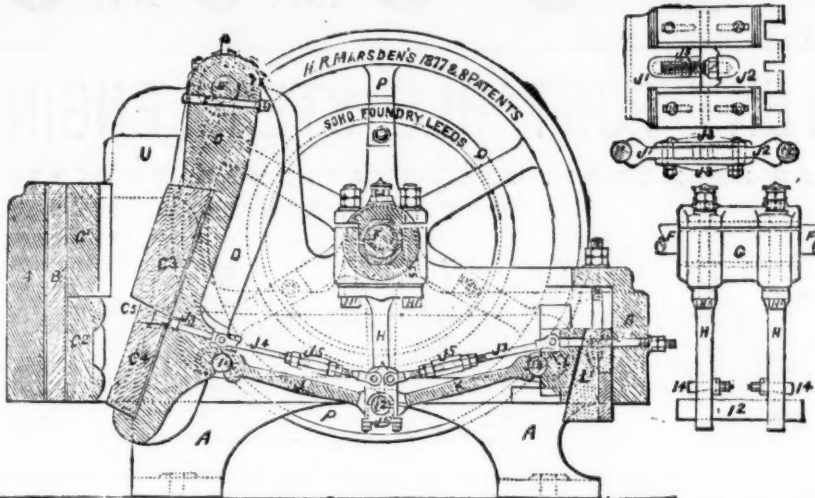
**NEW PATENT WROUGHT-IRON CONNECTING  
ROD.**

**New Patent Draw-back  
Motion.**

**NEW PATENT STEEL TOGGLE BEARINGS.**

**60**

**PRIZE MEDALS.**



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DEAR SIR,—We have adopted your Stone Breakers at  
many of the mines under our management, and are  
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We are, yours faithfully,  
JOHN TAYLOR AND SONS.

H. R. Marsden, Esq.,  
Soho Foundry, Meadow-lane, Leeds.

St. John del Rey Mining Company (Limited).  
A SAVING OF FIFTY-FIVE HANDS BY THE USE OF  
ONE MEDIUM-SIZED MACHINE.

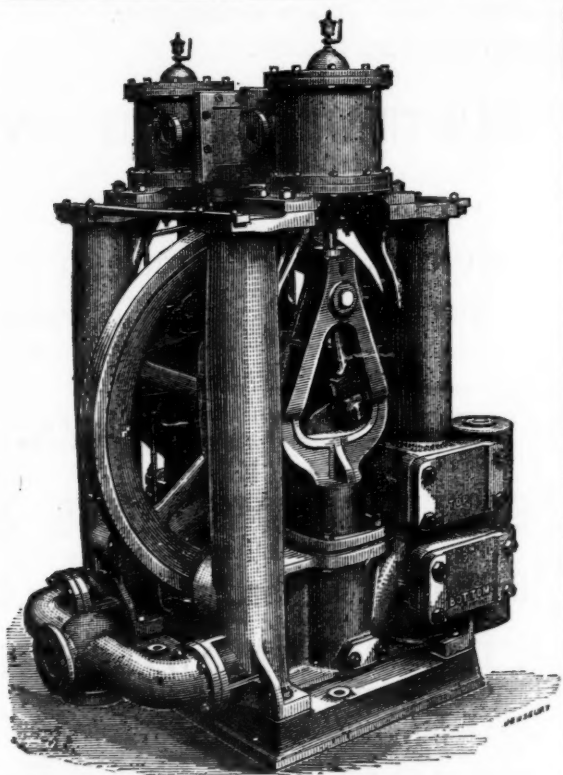
BLAKE'S STONE BREAKER.—Statement made by the Managing Director of the St. John del Rey Mining Company, Mr. John Hockin, with regard to six months' practical working of Blake's Stone Breaker, affording facility for judging of the relative economy of machine and hand labour in this kind of work, and also of the cost of getting the Stone Breaker to work in difficult places. The price paid to Mr. Marsden for the machine referred to by Mr. Hockin was £180, and adding to this the cost of engine, carriage, and fixing, the aggregate cost to the company of the Breaker in working order was £500. By this outlay the company is enabled to dispense with the labour of 55 people, the value of which is £800 per annum. The cost of working the machine could not be more than the wages of about five men (the machine requires but one man to feed it, so that the rest would be for engineer, fuel, oil, &c.), and allowing for interest on outlay and for renewal when necessary, the saving must be enormous.—Mining Journal.

**GREATLY REDUCED PRICES ON APPLICATION.**

**ALL BEARINGS are renewable, and made of H.R.M.'s Patent Compound ANTIFRICTION METAL.**

CATALOGUES, TESTIMONIALS, &c.

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HIGHEST AWARDS:—



PARIS EXHIBITION, 1878.  
YORK EXHIBITION, 1879.

**SALMON, BARNES, & CO.,**

MANUFACTURERS OF THE PATENT

**ROANHEAD ROCK DRILL,**

ALSO OF

ATKINSONS PATENT



PARIS EXHIBITION, 1878.

### FEEDWATER HEATER.

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